February 3, 1947

STEEL

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The Magazine of Metalworking and Metalproducing

ESTABLISHED 1882

EDITORIAL INDEX, PAGE 59

VALLEY MOULD & IRON CORP.

General Offices: HUBBARD, OHIO

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Increase production with this DOUBLE SLIDE Bore-Matic

Heald No. 42 Bore-Matic provides two-way slide motion at right angles

WHEN YOU'VE GOT a heavy production schedule to meet, here's the machine that can carry a double load. It's the Heald No. 42 Bore-Matic, incorporating two hydraulically-controlled slide movements at right angles.

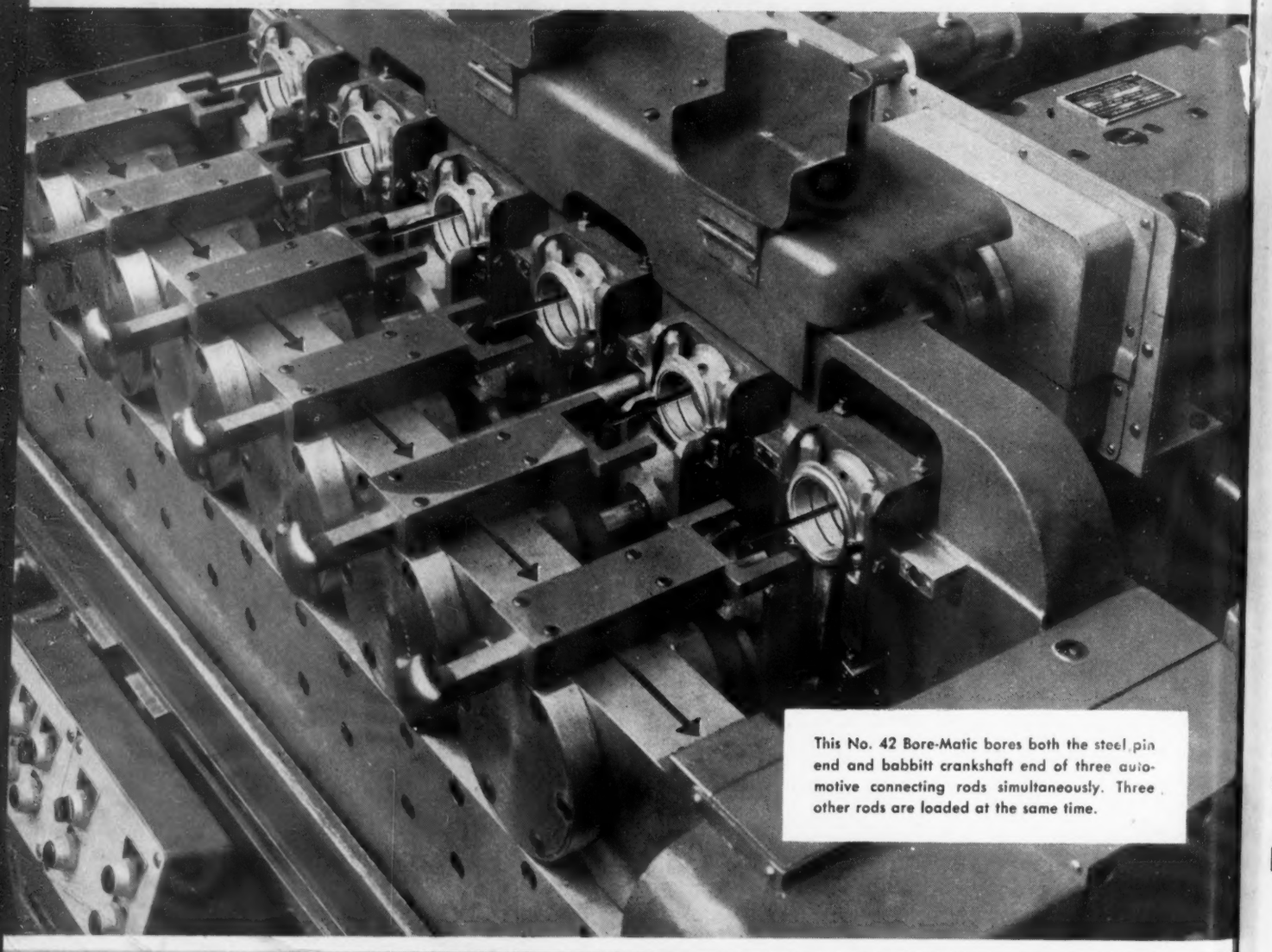
Think how you can speed your work by combining boring, turning, plunge grooving and facing operations on this one machine—in a single automatic cycle. In addition, multiple stations substantially boost production; and simultaneous loading and borizing eliminate costly handling time.

The No. 42 Bore-Matic will perform both roughing and finishing operations on a wide variety of parts, such as connecting rods, pistons, pump housings and cylinder sleeves. For further information, get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision . . . less cost

Branch Offices at Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

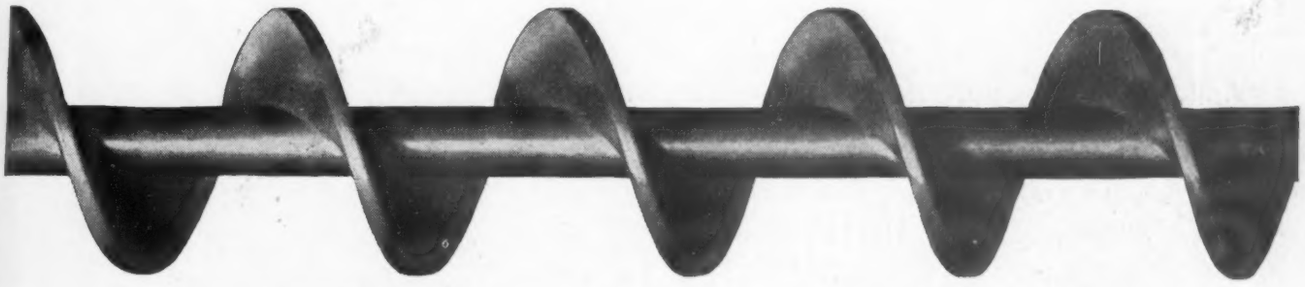


This No. 42 Bore-Matic bores both the steel pin end and babbitt crankshaft end of three automotive connecting rods simultaneously. Three other rods are loaded at the same time.

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

Solving the Problem of the FAILING STOKER WORM

Carbon steel stoker worm that failed in service. The fin was originally of the same diameter throughout the length of this worm. The tapered wear of both the fin and core at the fire-box end (left) show the damaging effects of abrasion, corrosion and heat.



New-type worm with fin and core made from special alloy steels recommended by Bethlehem metallurgists. This type of worm has withstood the chemical actions, harsh wear in service and elevated temperatures. It has far outlasted worms of ordinary carbon steel.

A prominent manufacturer of domestic coal stokers found that 45 percent of the repair jobs on his stokers were the result of worm failures. So he took his problem to Bethlehem metallurgists.

Metallurgical tests showed corrosion to be an important factor in the trouble. Moisture and sulphur dioxide accelerated the scaling. Abrasion, another factor, was obviously present where coal was moved by a spiral conveyor. Heat was the third factor contributing to failure, due to the accelerated chemical action and loss of hardness at elevated temperatures.

Based upon these metallurgical findings, the following recommendations were made:

1. Fin thickness be increased for longer wear, and worm speeds be increased to compensate for the thicker fins.
2. The center bar be made of a high-tensile, low-alloy, corrosion-resisting steel, and the fin be special abrasion-resisting, heat-resisting steel.

These recommendations were followed, with the result that the manufacturer experienced a material improvement in worm-life.

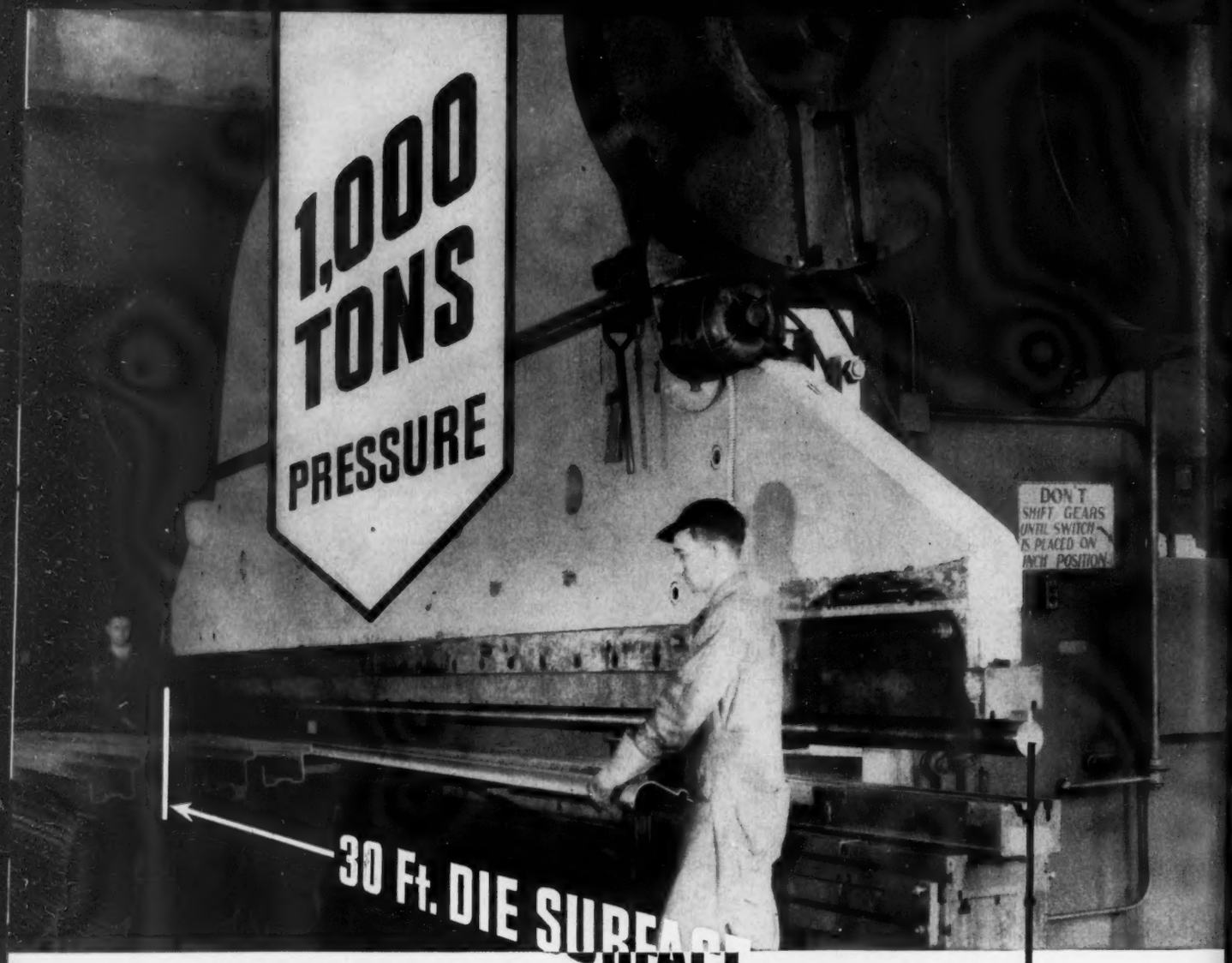
This is a typical example, of many that might be cited from our files, of the metallurgical service and advice that Bethlehem makes available to users of alloy steels in all industrial fields. If you have a problem touching on alloy steels, their treatment or application, Bethlehem metallurgists will be glad to offer their recommendations.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM ALLOY STEELS

★ BETHLEHEM STEEL ★



Photo—Courtesy of American Rolling Mill Company

The Cincinnati 500 Series Press Brake has the power and rigidity for accurately forming **single** bends 15′ to 20′ long in **heavy plate**—or forming **multiple** bends 25′ to 30′ long in LIGHT PLATE and SHEETS.

Our Engineering Department is ready to discuss with you the possibility of the profitable use of these powerful machines, whether for the forming of tanks and structural members, machinery parts, or general fabrication.

Let our representative show you a Cincinnati installation in your neighborhood.

Write for Brake Catalog No. B-2, suggesting many uses, and illustrating the Cincinnati line.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Magnet cures headache

Emilia Bojanowski
J & H Associate,
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Extra values through

JACK & HEINTZ

Mass Precision

Magnetizing of Magnetos usually takes five operations: (1) assemble magneto, (2) adjust bearings, (3) disassemble magneto, (4) magnetize rotor, (5) reassemble magneto. Operations (3) and (5) were production headaches. These were eliminated by Jack & Heintz engineers who developed a giant magnetizing device by which the rotors are magnetized through the magneto frame . . . *after* assembly. Result: higher quality and faster production of urgently-needed Eisemann magnetos.

Achievements of Jack & Heintz *mass precision* such as this are creating extra values in magnetos, electric motors, bearings, refrigeration compressors and aircraft accessories *today* and in revolutionary developments for *tomorrow.*

JACK & HEINTZ PRECISION INDUSTRIES, INC., ***Cleveland 1, Ohio***

Behind the Scenes...

Glammer ala Quonset

We've all known that the armed forces used the quonset hut for just about everything imaginable during the war (and are still using them) but perhaps some of you hadn't realized, as we hadn't, the extent to which this military development has permeated the postwar scene in this land of ours. Brought to a focus by an ad we spotted in a Washington (D. C.) paper, this trend is becoming of major proportions. Seems that an estimable gent named Kelly is running a jernt known as the "Quonset Inn," housed in one of them things, described in his advertising something like this, "Enjoying your Favorite Cocktails while Delighting in the Beautiful Quonset Cocktail Lounge, etc., etc.,". Well, maybe. But we're sure that there are many more of these Q. H.'s being used on the farm than to house the peregrinations of the nation's cafe society.

Guaranteed Wage Dope

There was some doubt expressed in certain quarters about the figure in our Yearbook study, "Prospects for 1947" which mentioned the number of plants now having guaranteed annual wage plans. We only reported what the plants in this industry of yours told us, and we are now happy to confound the scoffers with some figures just released by the Department of Labor, which has been investigating the guaranteed annual wage and which reports findings in more than 500 establishments whose workers are covered by such a plan. If you're interested, the dope is contained in an interim report submitted by Murray W. Latimer, Bureau of Labor Statistics, Department of Labor.

Puzzles et Answers

Consensus of answers to the ladder-and-alley problem seems to agree on the 26.03+ figure, whether arrived at geometrically, algebraically, or simply by laying the thing out on a drawing board. If you liked that one, take a stab at this: An eccentric farmer built his house in the center of his land and surrounded it by a circular concrete wall, which enclosed exactly an acre of ground, including the ground on which the wall stood. Then he tethered his horse to a ring in the outside of the wall by means of a rope 100 feet long. Now, my friends, the problem is this—what was the area over which the horse could graze? He obviously couldn't graze inside the walled part, and it would make it a lot easier for us if you get your answers in square feet, because the only answer we have is in that measure. We might point out, while on the subject of problems, that the first two correct answers to the ladder-and-alley problem came from Indiana—one from C. E. Hoekstra of Magnavox at Ft. Wayne, and the other from D. A. Cotton of Delco at Anderson. Any collusion, boys?

Fire—On the House

What with all the publicity recently on hotel fires and particularly fires in southern hotels, our ace circulation salesman Gary Hewitt had a violent scare the other morning in Chattanooga when he was awakened by the sound of sirens, looked out his hotel window, and saw the firemen rushing into the lobby nine floors below. Turned out to be a fire in the cocktail lounge, but Gary decided he was getting close to the edge in his flirtation with the law of averages. Which reminds us that a salesman who covers the southern territory for a materials handling firm stopped by our booth at the Materials Handling Show and told us he is now carrying a length of nylon rope in his brief case for just such emergencies.

Index Is On Deck

Now about ready for the printer is our Topical Index for 1946. This is a pocket-size index of all major articles which appeared in STEEL during 1946, classified according to subjects. Not to be confused with the regular alphabetic index published every six months, this little job is an excellent bibliography of articles published last year on such subjects as welding, machining, labor, government activities and some 30-odd other subjects. If you'd like a copy or copies, drop us a line and we'll be most pleased to send same as soon as they are off the press.

No More Scrap for Jap

Editor Irwin Such dropped by to show us a Christmas card he recently received from Japan, from one Tadayuki Ota, who says he is now with the Federation of Economic Organizations, helping to rebuild and rehabilitate the Japanese nation. Editor Such says this is the same guy who was in charge of all scrap buying for Japan in the days before the war, now apparently turned to more peaceful pursuits.

Shrdlu

(Editorial Index—page 59)

STEEL
Vol. 120—No. 5 February 3, 1947

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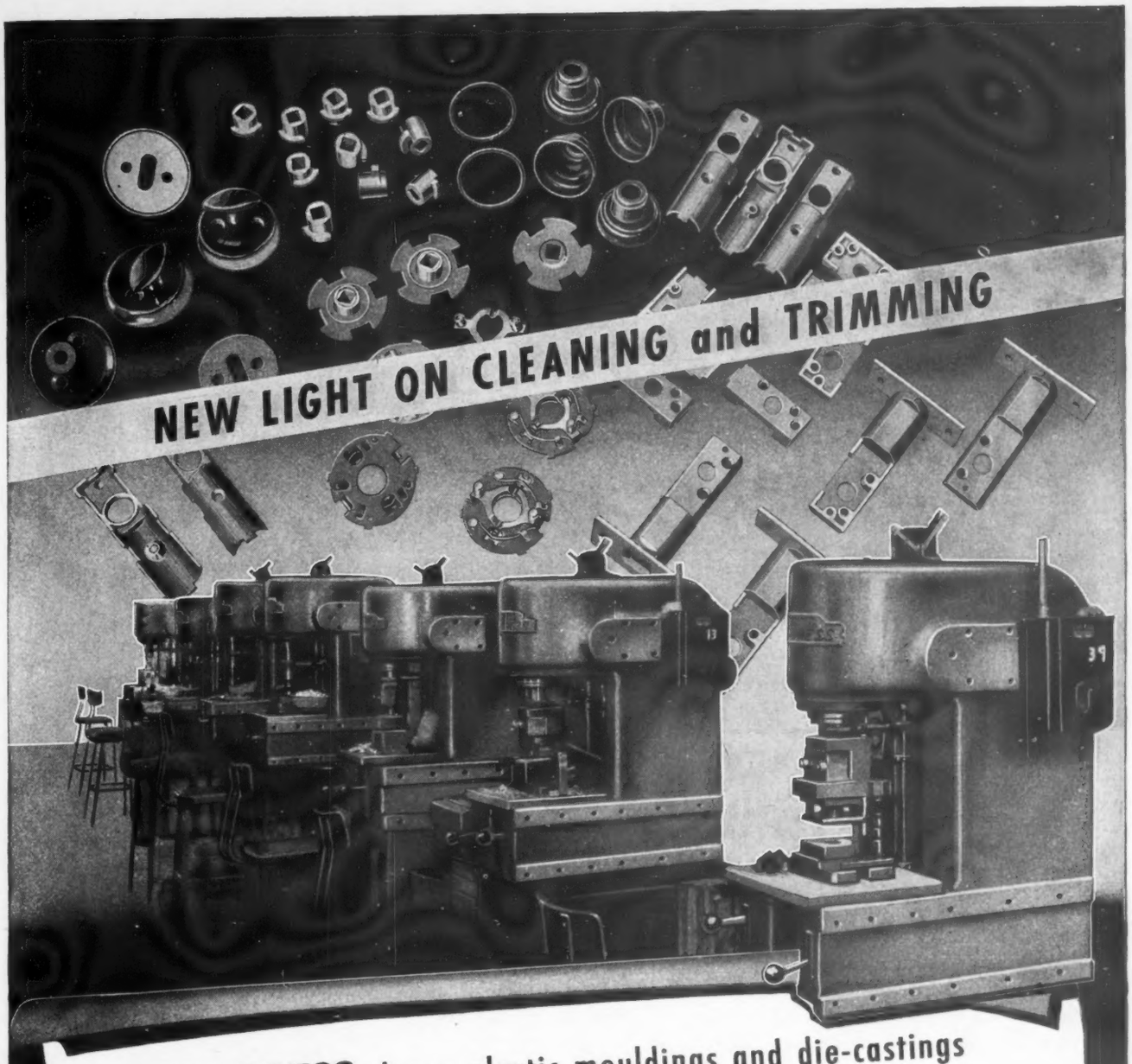
Editorial Staff on Contents Page



MULTIPRESS cleans plastic mouldings and die-castings

PROOF that MULTIPRESS does a quick, clean, accurate job of trimming both plastic mouldings and metal die castings is found in results obtained from the eight-unit MULTIPRESS line-up shown above.

These MULTIPRESSES at the Los Angeles plant of the Pacific Plastic and Manufacturing Co., Inc., *average* 7000 trimmed parts per day —about one every four seconds!

MULTIPRESS pressures can be preset at the exact level required for each job *without use of excess tonnage*. This reduces tool wear and prevents damage to either the press or the tooling if unusually heavy metal is encountered.

Operators also report that closely regulated pressures *plus* the controlled speed of the MULTIPRESS ram reduces distortion or fracture of off-dimension parts.

Another MULTIPRESS advantage is that its working stroke can readily be adjusted to parts of various sizes. This cuts costs in switching from one trimming operation to another.

MULTIPRESS is built in 4, 6, and 8-ton capacities, offering seven models in each size with either manual or automatic controls. A wide variety of *standard* MULTIPRESS toolings and accessories are available for many different types of operations. Write for complete details!

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HydrOILics INDUSTRY'S RIGHT HAND

DENISON EQUIPMENT in APPLIED HydrOILics

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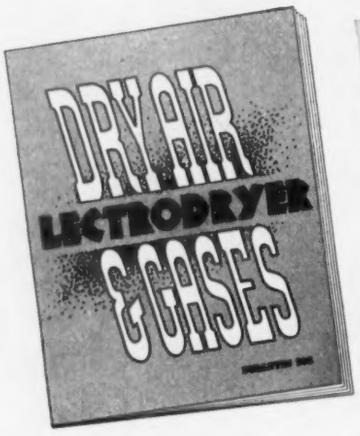
DRYing with LECTRODRYERS*



Is moisture in materials being processed slowing down your production and cutting its quality? Lectrodryers can be placed "on stream" to keep processes on the straight and narrow path.

Are high humidities in manufacturing and storage rooms upsetting your production? Lectrodryers working with automatic controls will correct that situation.

Mail the coupon below for the new book, "Lectrodryer Bulletin 105". Or tell us your immediate DRYing problem and our engineers will suggest a cure.

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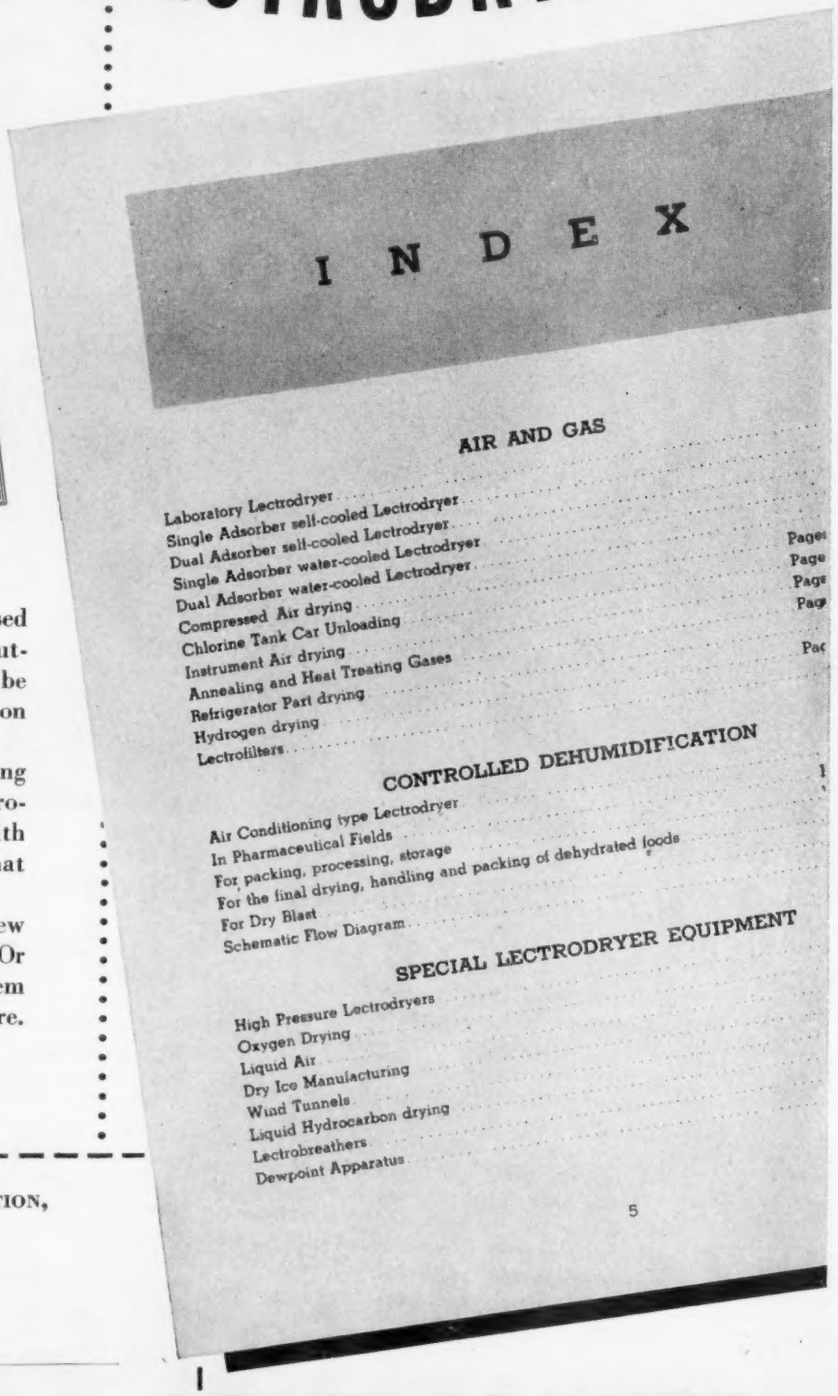

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Dual Adsorber self-cooled Lectrodryer
Single Adsorber water-cooled Lectrodryer
Dual Adsorber water-cooled Lectrodryer
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In Pharmaceutical Fields
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For the final drying, handling and packing of dehydrated foods
For Dry Blast
Schematic Flow Diagram

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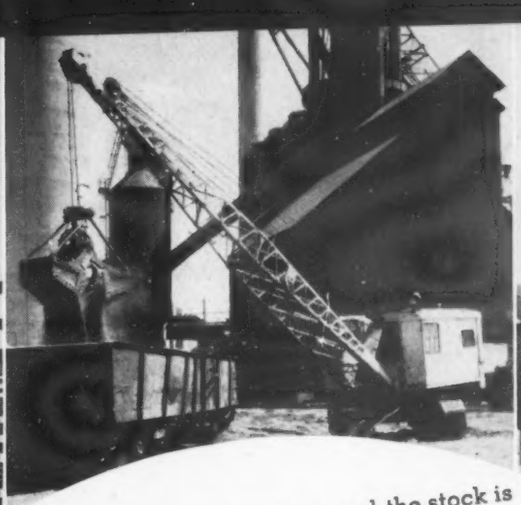

Putting it WHERE you want it! WHEN you want it!

WHEN the plant is humming and the stock is rolling into the storeyard; When production is going smooth and the cars are on the siding; Then is the time you want Northwest dependability and versatility.

Your Northwest Crawler Crane brings you a combination of features that mean smoother, faster handling and higher output—a combination of features exclusively Northwest.

The "Feather-Touch" Clutch Control gives you matchless smoothness of handling, the kind of handling that means something in spotting loads. It gives ease of operation, the feel of the load, all without complications, and it eliminates shutdowns due to control failure.

Uniform Swing Clutches give cool running, eliminate the grabs and jerks of swinging.

Front-end cab and window design provides for high vision when loading overhead decks or stocking to high piles.

Boom Hoist operates with power both up and down, and there is a choice of Boom Hoists to permit live boom operation independent of other operations. Add to this the fact that a Northwest Crawler Crane goes anywhere, is not confined to tracks and makes the far corners of the yard usable.

Plan ahead now to be Northwest equipped. Let us send you complete details on other Northwest features.

4 to 44 tons

NORTHWEST

The Crane that goes Anywhere!

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One more Bearing . .

CONVENTIONAL DESIGN

Spindles on most milling machines are supported by only 2 bearings. There is no support at the center of the shaft, where deflection is most likely to take place.

KEARNEY & TRECKER DESIGN

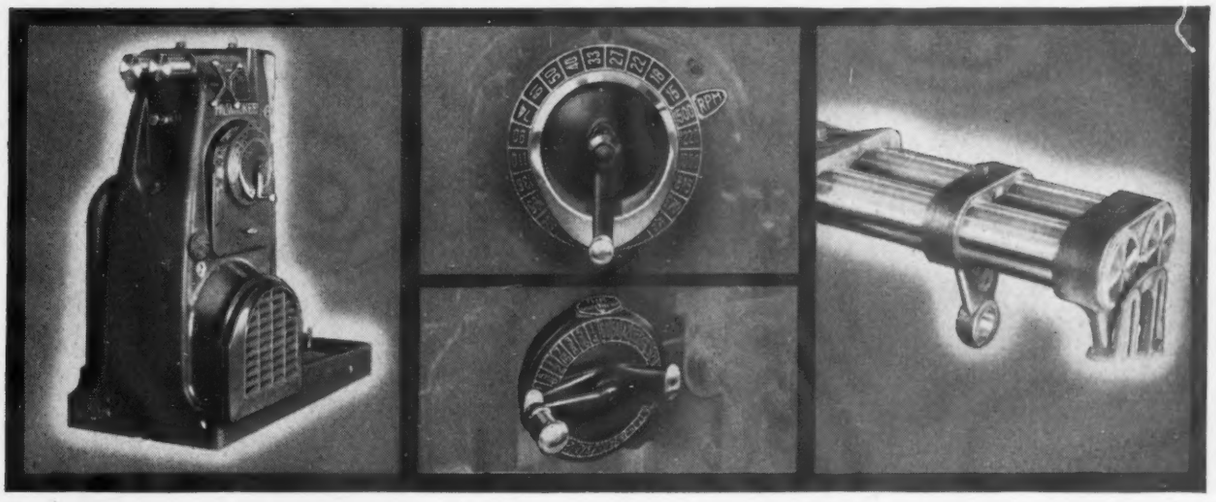
SO BASIC — SO SOUND

Because spindle deflection varies directly as the cube of the unsupported length between bearings, the additional support of the center bearing on Kearney & Trecker spindles increases rigidity 800%. That means deflection, vibration, wear are cut to minimum. Accuracy, precision, longer machine and tool life are the results — proven for years in Kearney & Trecker installations throughout the world.

KEARNEY & TRECKER
MILWAUKEE

800% more rigidity!

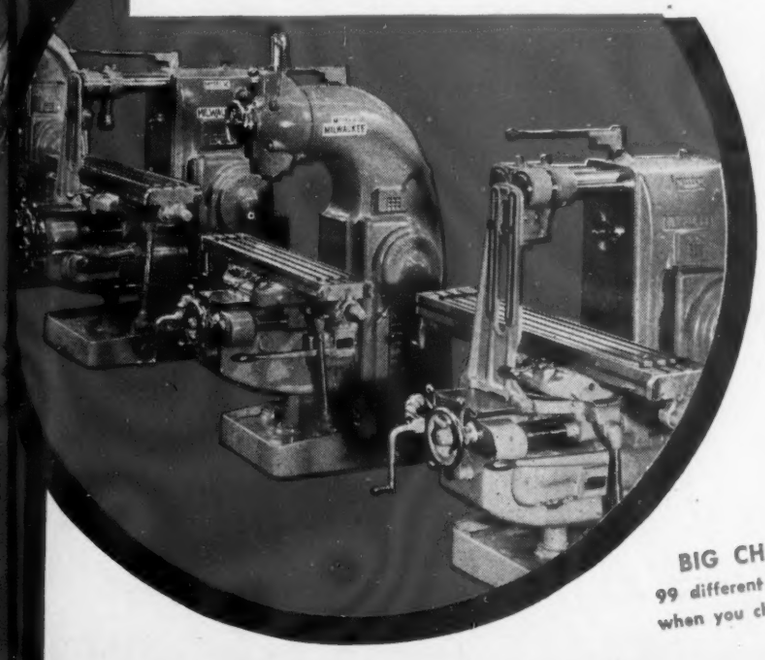
Secret of modern milling machine accuracy and longer tool life lies in three bearing spindle design . . . one of the many great features of Kearney & Trecker Milwaukee Milling Machines . . .



Look at that column! Pyramid shape, wide base, solid back, box-type ribbing give you maximum rigidity and vibration-free operation. That means accuracy and long tool life.

Quick-change dials for the selection of speeds and feeds. Broad ranges of spindle speeds and table feeds in approximate geometric progression give you the right cutting formula for almost any material.

Those double overarms provide maximum rigidity to tool set-ups — assure proper alignment and provide easy access to arbor and cutters. That means greater precision, less tool wear.



Catalog E-53 gives you complete data on our entire line — Write for it! Please indicate your business connection.

KEARNEY & TRECKER CORPORATION

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99 different models, sizes and types to choose from when you choose a Kearney & Trecker — Milwaukee.

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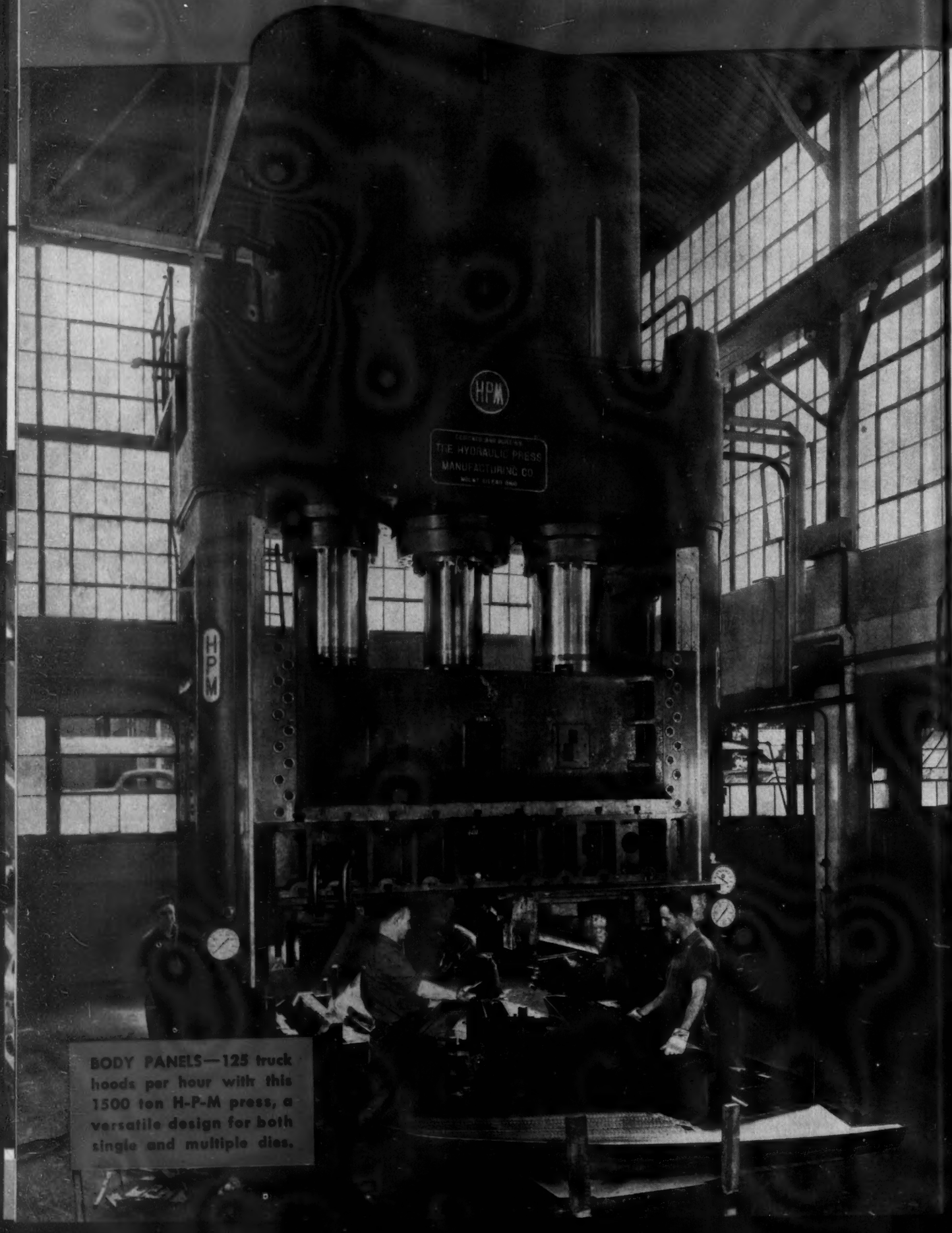


BODY PANELS—125 truck hoods per hour with this 1500 ton H-P-M press, a versatile design for both single and multiple dies.

N OF AUTOMOTIVE PARTS

HPM

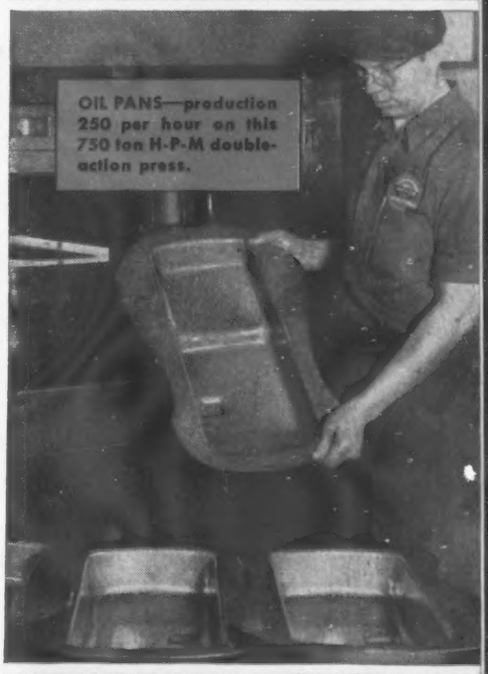
HYDRAULIC PRESSES

BRAKE PARTS—drawn and coined at the rate of 300 per hour on a 750 ton H-P-M press with 250 ton die cushion.

Smooth, shockless power, evenly applied—at mass production speed —that's the key to profitable press work on automotive parts. You can get it with H-P-M Hydraulic Presses. You'll get greater flexibility, too—with closer control and more versatility.

The six operations pictured are typical of a wide variety of automotive work where H-P-M has a proved record of *successful* application. In addition, H-P-M Presses are producing wheels, bumpers, truck running boards, axle and differential housings—and many others, including such specialized parts as bearings. We're ready to put this experience to work for you. Send for an H-P-M engineer and challenge him to show you how hydraulic presses can improve your production. Special orders are routine business for us. May we help you?

Write for your free copy of bulletin 4400. It tells you how high speed press operation is accomplished with the exclusive H-P-M closed circuit.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THE BOARDLESS "BOARD DROP HAMMER"

NO BOARDS · NO BELTS · NO MOTORS

NEW!

Announcing the CHAMBERSBURG

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CHAMBERSBURG Engineering Company marks its 50th Anniversary with the introduction of a new gravity drop hammer that represents a tremendous advance in drop forging practice. Designed for work customarily assigned to the board drop hammer, the CECO-DROP will outproduce any existing gravity drop hammer.

Eliminating boards, the CECO-DROP lifts the ram by means of air or steam, holds it by a simple ingenious clamp and drops it by an air valve operated by foot treadle. Performance records to date show at least 10% more forgings than on conventional gravity drop hammers, with simplicity, safety and low maintenance as additional features.

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Builders of IMPACT *Machinery*

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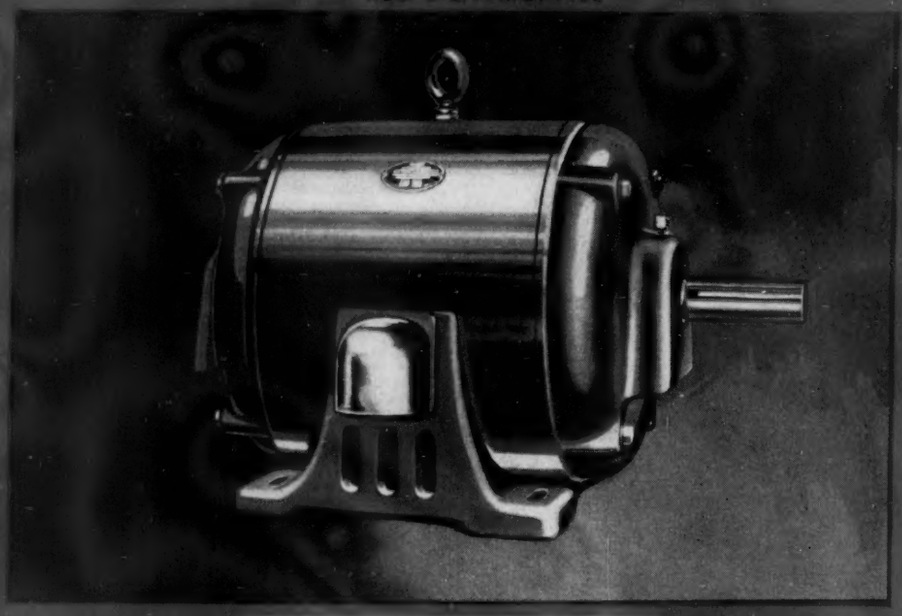

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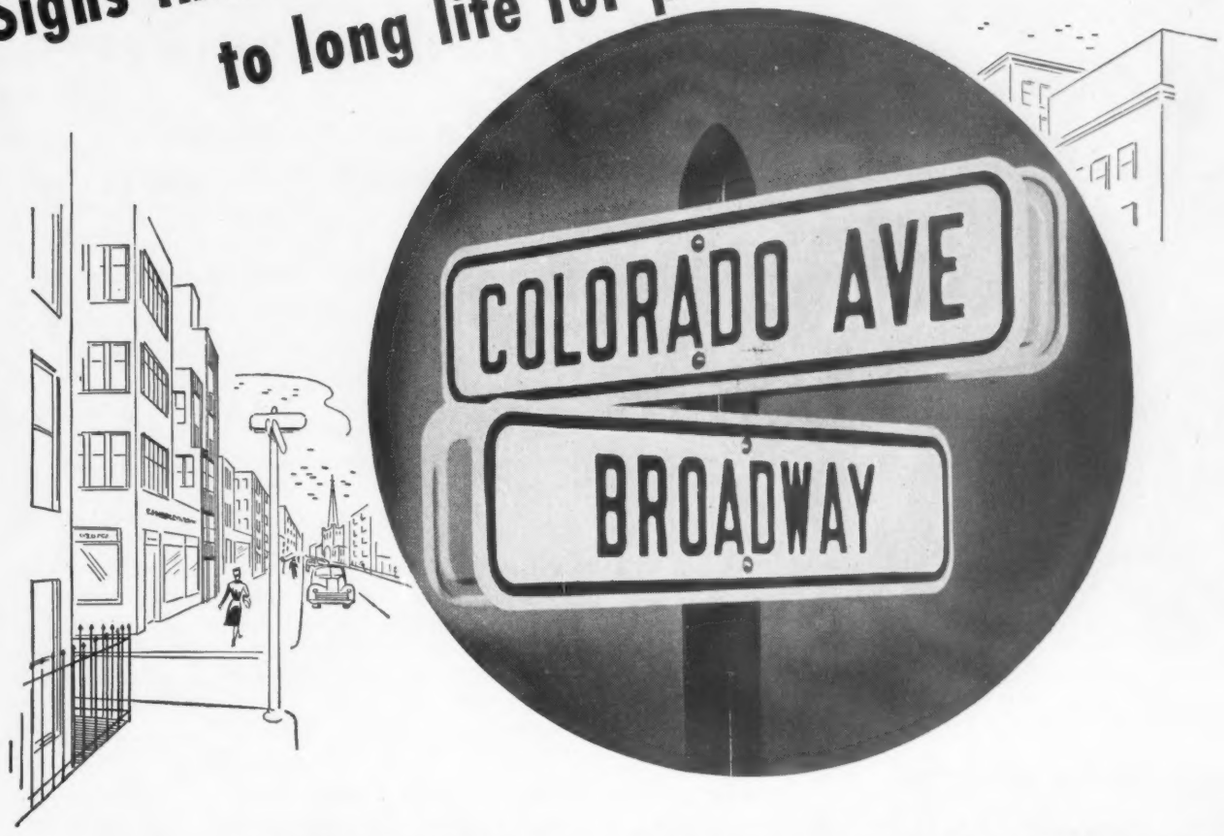
PLANTS AT DAYTON, WILMINGTON AND XENIA, OHIO—OFFICES IN PRINCIPAL CITIES

Signs that point the way to long life for painted metal surfaces



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REPUBLIC STEEL
ELECTRO ZINC PLATED SHEETS
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Other Republic Products include Carbon, Alloy and Stainless Steels—Sheets, Strip, Plates, Bars, Pipe, Tubing, Bolts and Nuts, Wire

NEW COMPLETE LINE OF *ROTO-FINISH* MACHINES

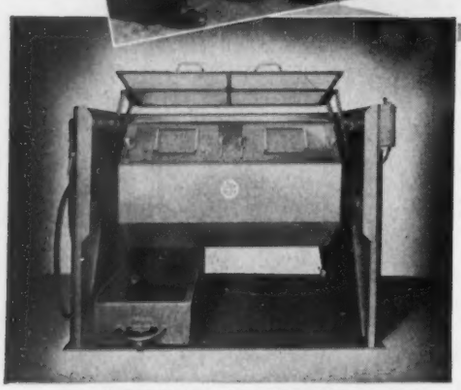
TO DO YOUR MECHANICAL FINISHING *QUICKER, EASIER, MORE EFFICIENTLY*

FOUR new improved Roto-Finish Machines and labor saving accessories are now available for use with Roto-Finish mechanical finishing—to provide even greater savings in time, costs and labor!

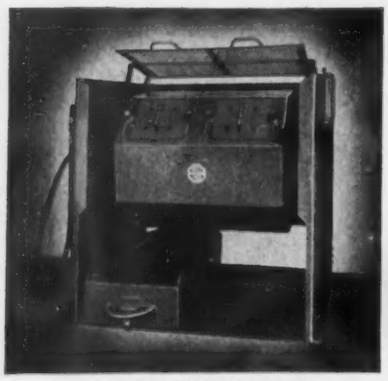
These features found in all four types of machines put your finishing operations on a speedier production basis:

1. Quick acting door mechanism. Light weight doors for easier, faster loading and unloading.
2. Rigid safety guard lifts easily, pivoting on positive control.
3. Hose and quick acting water valve mounted conveniently on frame of machine.
4. Integral mounted motor provides steady, stable drive. Easily accessible for maintenance. Shielded for water protection.
5. Machines have swivel type hoist pan for greater movability. Equipped with safety lock type cross bar for hoist operation.
6. Forward-reversing switch and magnetic brake control location of cylinder doors to facilitate loading and unloading.
7. All welded steel cylinders are hard wood lined. Compartments have patented relining feature.

THE STURGIS PRODUCTS CO., 787 JACOB ST., STURGIS, MICH.



Roto-Finish Model CW 60-2 Machine
Compartment size 27" x 32" I. D.

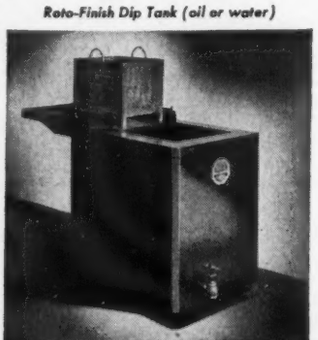


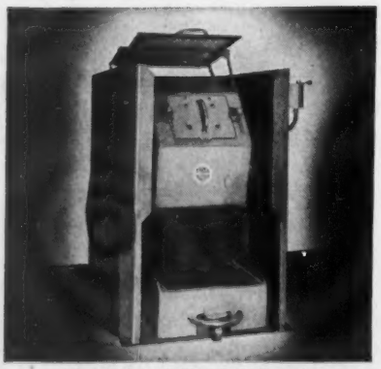
Roto-Finish Model CW 45-2 Machine
Compartment size 19" x 32" I. D.

Roto-Finish Dual Midget Machine
Compartment size 8" wide, 12" across flats

SPEEDS HANDLING— REDUCES LABOR BURDEN!

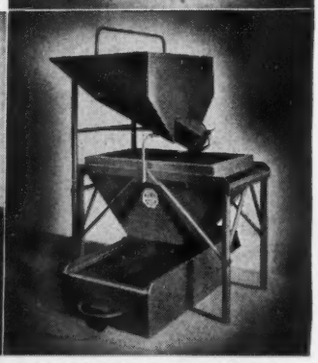
Roto-Finish Dip Tank (oil or water)





Roto-Finish Model CW 22-1 Machine
Compartment size 19" x 32" I. D.

Roto-Finish Chip Bin

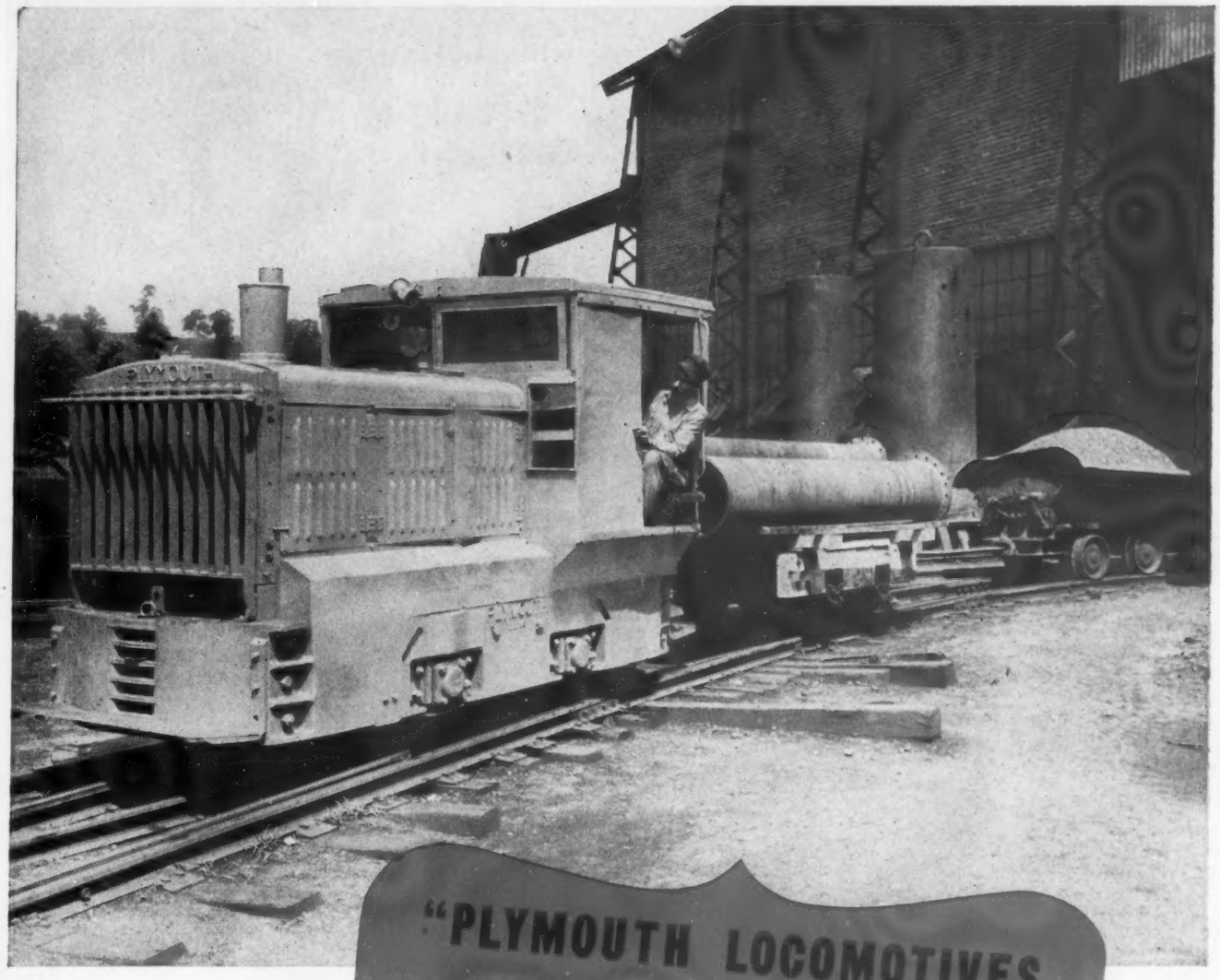


Roto-Finish Separating Table with Hopper

ROTO FINISH

Send For New Folder! Shows How You Can Save With Roto-Finish!

The Accepted Mechanical Finishing Process For Grinding, De-Burring, Polishing, Britehoning, Coloring



"Best for our work" is the way Mr. R. S. Dewer, Works Manager of Lynchburg Foundry Company, Inc., describes the three Plymouth Locomotives in service at this Lynchburg, Virginia plant.

Used in hauling raw materials to cupolas, for moving molten iron to various production departments, and for transporting rough castings and finished products, these Plymouths provide "transportation that is fast and inexpensive . . . operating and maintenance costs are satisfactory . . . we consider them as important as any equipment in our plant."

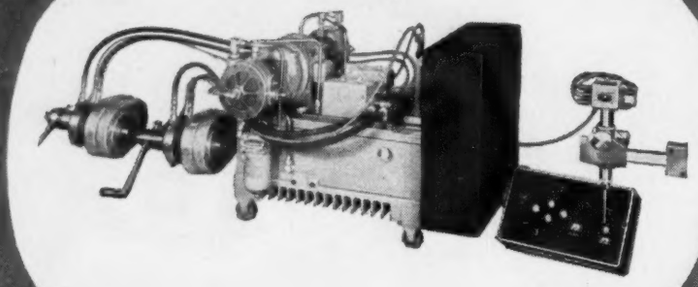
Plymouth Locomotives, designed for economical intraplant transportation, built for dependable service, can be "best for your work," too. Whatever your plant haulage problem, you'll be interested in the Plymouth story . . . write Plymouth Locomotive Works, Dept. 1, Plymouth, Ohio.

PLYMOUTH LOCOMOTIVES

GASOLINE, DIESEL MECHANICAL AND DIESEL ELECTRIC

PLYMOUTH LOCOMOTIVE WORKS • Division of The Fate-Root-Heath Co., Plymouth, Ohio, U.S.A.

THE DUPLIMATIC



FORMERLY MANUFACTURED BY THE DETROIT UNIVERSAL DUPLICATOR CO.

NOW IS A PRODUCT OF THE LODGE & SHIPLEY CO.

EXCLUSIVELY FOR

LODGE & SHIPLEY LATHES

FOR CONTOUR TURNING AND CONTOUR FACING

The DUPLIMATIC is now being produced by the Machine Tool Division of The Lodge & Shipley Company for the exclusive application on the new Lodge & Shipley Lathes equipped at the factory.

With the DUPLIMATIC forming an integral part of their complete line of Lathes, Lodge & Shipley now offers a wider range of turning and contouring possibilities, and greater production at lower cost.

The DUPLIMATIC does not interfere with the use of the Lathe on regular single-piece jobs in the shop or in the Tool Room. Your regular lathe work, plus added versatility for step turning, contour turning and contour facing is a feature of the DUPLIMATIC.

Investigate its savings in your shop. Descriptive catalog matter will be available in the near future.

THE WORLD OVER · KNOWN FOR GOOD LATHES ONLY · L&S LATHES

THE LODGE & SHIPLEY COMPANY

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

THE *NEW* ARITHMETIC IN STEEL

SUBTRACT— ¼ OF THE STEEL PER PRODUCT—

ADD— ⅓ MORE PRODUCTS PER TON

3 TONS OF N-A-X HIGH-TENSILE WILL DO THE WORK OF 4 TONS OF CARBON SHEET STEEL— WITH NO SACRIFICE IN PRODUCT STRENGTH

N-A-X HIGH-TENSILE is now making possible the production of more and better products per ton of steel in many plants.

It is a common experience to find that sections can be made as much as 25% lighter—with no loss of strength, and with an increase in durability. That is because N-A-X HIGH-TENSILE is so much stronger and tougher, so much more resistant to fatigue and corrosion, than ordinary carbon sheet steel. The difference between the two is so marked that three tons of N-A-X HIGH-TENSILE will ordinarily do the work of four tons of the other.

Yet with all its strength, N-A-X HIGH-TENSILE has excellent formability. It can be cold-formed and deep-drawn to produce intricate parts; and it has good weldability. These superior qualities bring you not only a better product—but also important economies in handling, fabricating and finishing.

The many advantages of N-A-X HIGH-TENSILE have created a demand that is in excess of the current supply. However, our engineers will be glad to discuss your specific problems with you against the day when this superior steel is available to all.

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—

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HIGH-TENSILE STEEL

GREAT LAKES STEEL
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N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

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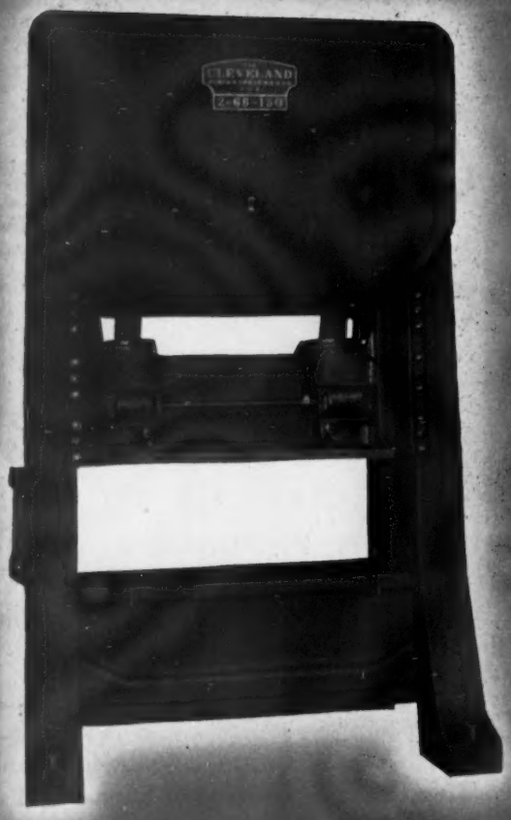
Modern CLEVELAND Presses



Cleveland 2-66-150 Two Point Press having a bed area of 36" x 66"; 12" stroke and 150 tons capacity.

Cleveland 2-120-350 Two Point Press having a bed area of 46" x 120"; 10" stroke and 350 tons capacity.

Designed to meet the most exacting requirements of modern manufacturing, Cleveland Two Point Presses are highly efficient, productive and economical in operation.

Their rugged compact construction assures long life and low upkeep while the features incorporated in their design provide faster, better and more accurate production.

Built in a wide range of sizes, they can be furnished in capacities to meet particular requirements.

The CLEVELAND PUNCH & SHEAR WORKS COMPANY. . Cleveland 14, Ohio

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Easy-Mounting, Fast-Locking Sheave

Pays Off

The First Time You Put It On!

"MAGIC-GRIP" *sheaves offer time-saving, money-saving features!*

EVEN if you install the sheave only once, and never change it again — it pays to get a "Magic Grip" sheave! For frequent changes, naturally, your savings pyramid.

- **No filing or reaming.** "Magic-Grip" bushing slides easily, even on oversize shafts.
- **No hammering or forcing** to damage motor bearings.
- **No wheel puller needed** to get the sheave off.
- **No set screws** to mar or score the shaft.
- **No wobble or blacklash.** "Magic-Grip" sheaves lock to shaft with shrunk-on grip.

HOW DOES IT WORK? Sheave and bushing come completely assembled. You just slip it on the shaft — align — and tighten three screws. *That's all!* And it comes off just as easily.

Standardize on time-saving, money-saving "Magic-Grip" sheaves. They're heavy duty, precision made and finely finished — the best sheaves you can buy . . . the best economy in the long run. Get them through your nearest A-C dealer or office.

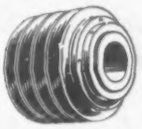
ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A 2166

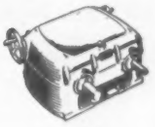
TEXROPE .. Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.



"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

"3C" Bulletin 106 D. C. SHOE TYPE BRAKES *available in 10", 14", 18", 21" and 26" Sizes—Series or Shunt Wound*

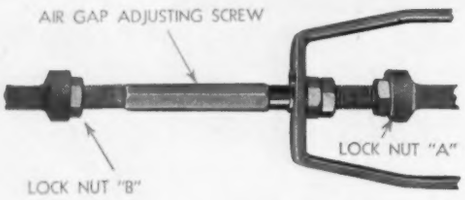
Thousands of these Brakes gave exceptional service in heavy duty Maritime service during World War II. They are now available for industrial use in the sizes shown above. Simplicity of installation and maintenance adjustments, plus long life and minimum wear in heavy duty applications are features. All adjustments are plainly visible—no feeler gauges or other devices required to secure accurate adjustments.

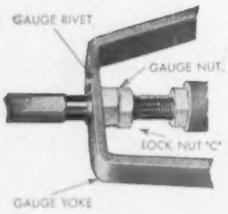
INSTALLATION ADJUSTMENTS

When the center line of the wheel mounted on the motor shaft does not coincide with that of the brake, the following simple adjustments are made with the magnet de-energized.

AIR GAP

Loosen lock nuts A and B, turn adjusting screw until air gap, measured between bottom of armature and magnet face, is 3/16" on 14" and larger brakes, or 1/8" on 10" size. Tighten lock nuts after adjustment is made.

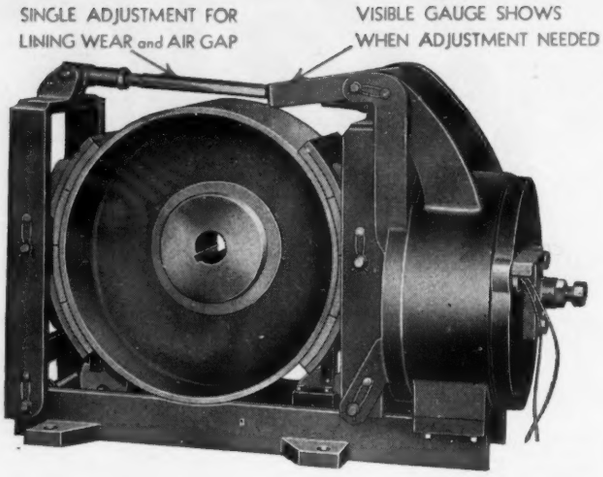




SHOE CLEARANCE

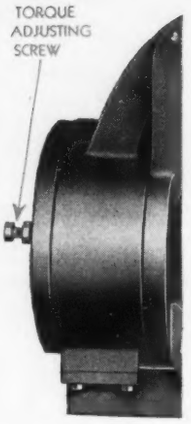
Loosen Lock Nut C, turn gauge nut until face of gauge nut sleeve is flush with face of gauge rivet. Tighten lock nut.

Our nearest District Office or Agency will gladly give you full details. Ask for Description Bulletin 106.



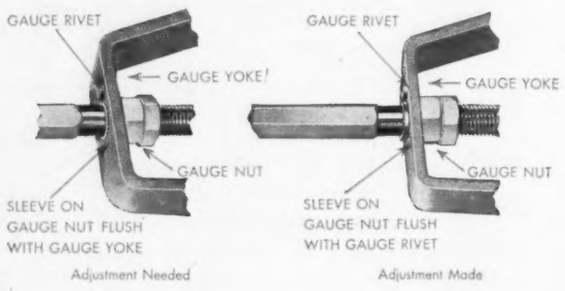
TORQUE

At shipment, the brake is set for full torque rating of the installed coil. This is usually equal to, or greater than the full load torque of the motor. To adjust, after installation, turn screw at rear center of magnet "IN" to increase or "OUT" to decrease torque setting of brake.



MAINTENANCE ADJUSTMENT

Lining wear is the only maintenance adjustment. Necessary adjustment can be checked at a glance. See pictures below



To adjust, loosen lock nuts A and B (see picture under "AIR GAP"). Turn adjusting screw until gauge nut sleeve is again flush with the gauge rivet. This one simple adjustment automatically adjusts for magnet air gap and shoe clearance. *That's simplicity that counts!*

THE CLARK CONTROLLER CO.

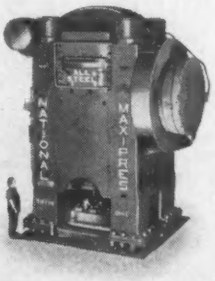
EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

COMPETITIVE

Highly competitive forgings...like this 13½" dia. pipe flange... are produced to best advantage on National High Speed Forging Maxipresses.

Increased output, savings of material, less machining and better physical properties are some of the reasons.

Our analysis of your forging problems is yours for the asking.



NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

It's Gotta Fit...

DEPENDABLE DAN
Our Customers' Man

IT MUST FIT YOUR JOB

RELIANCE

JOB-FITTED STEEL

Best fitted to do a specific job for a specific customer at a specific time — and all factors considered, at lowest cost.

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ALUMINUM SHEETS and STRIP—available through locations marked

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HOUGHTON ANNOUNCES A NEW SERIES OF METAL CLEANERS

THE HOUGHTO-CLEAN "200" SERIES IS:

1. FASTER !

2. MORE EFFICIENT !

3. U-V* PROVED !

We laid aside all tradition, seeking a new concept of the whole metal-cleaning function. The former Houghto-Clean series, excellent in its day, had become out-moded by the development of new detergents, wetting agents and war-born alkalies.

After a two-year study, we perfected new formulae for each job of cleaning metal surfaces. Results: a better job, *faster*—reducing cleaning time to less than half, as compared to pre-war cleaners. That, in a few words, is the Houghto-Clean "200" story; for more, send the coupon.

82 years' experience

Houghton is no new-comer in metal processing. Its record dates back to 1865; through those many years it has pioneered in cleaners, cutting oils, rust preventives, heat treating salts, quenching oils and drawing compounds. Houghton service on all of these is highly regarded by metal-men. E. F. HOUGHTON & CO., 303 W. Lehigh Avenue, Philadelphia 33, Pa.

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* *Ultra-violet light was used to evaluate each of the 17 new Houghto-Cleans. Residues remaining on metal plates after various timed periods of cleaning glow with fluorescence, revealing what daylight vision cannot detect.*

E. F. HOUGHTON & CO.
303 W. Lehigh Ave., Phila. 33, Pa.

Please send me the new Houghto-Clean "200" folder, and recommend a type for.....

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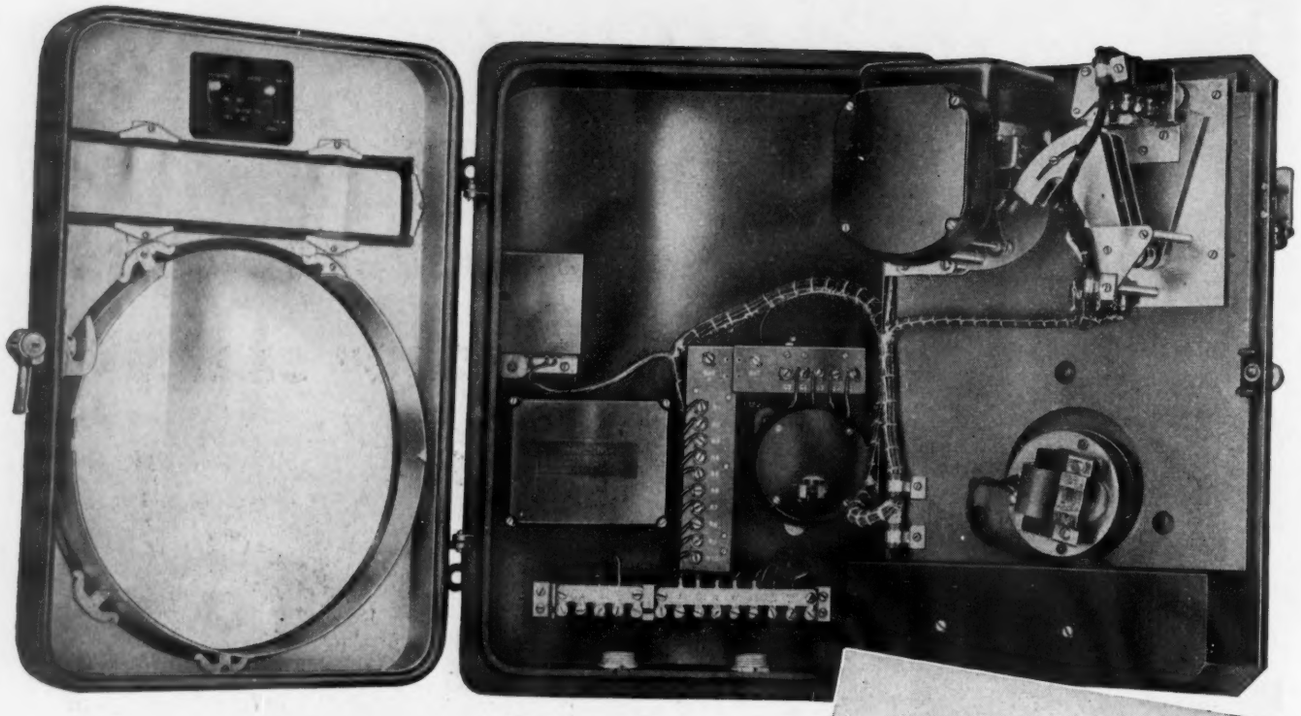
Name.....

Company.....

Street.....

City.....



Bristol MICROACT Controller Model 431, Type 30. Note that all parts are accessible even when operating. No lubrication needed. Cold-junction compensator is fully automatic. No mechanical connection between galvanometer and other units, so galvanometer can be protected from dust and air currents when door is open.

There's No Fuel Like a Controlled Fuel

Bristol MICROACT Controllers keep temperature right in oil-or-gas fired equipment

Bristol Pyromaster Controllers — instant response, unaffected by vibration, no mechanical motion except when temperature changes — are offered in models for use with electrically-operated fuel control apparatus...also magnetic switches for electrically-heated equipment.

These MICROACT Controllers have snap-acting precision switches which operate from a rugged, accurately adjusted cam mechanism to open and close the electric circuits of the fuel apparatus with precision control.

The following types are offered:

Low — Open; High — Open; Low — High — controls two load circuits; Low — Open — High — controls two load circuits; Low — Normal — High — controls three load circuits and various combination of these types.

Also offered for Proportioning and Proportional Current-Input Control.

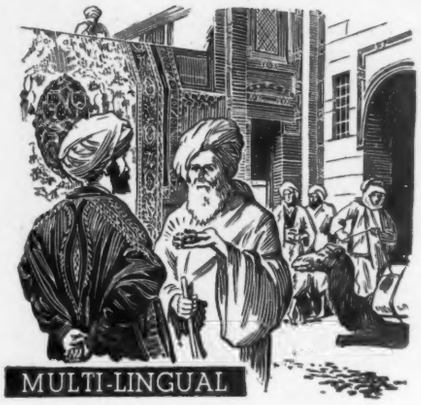
Write for Bulletin PB1226, addressing THE BRISTOL COMPANY, 105 Bristol Road, Waterbury 91, Conn. (The Bristol Co. of Canada Ltd., Toronto, Ont. Bristol's Instrument Co. Ltd., London, N. W. 10, England.)

AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS

BRISTOL

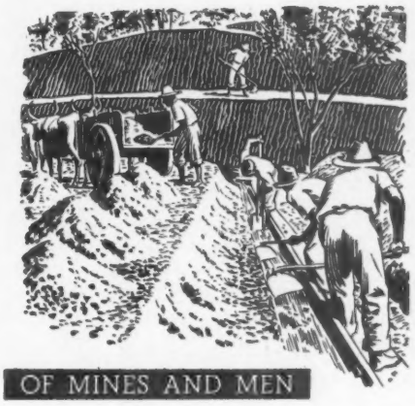
... Gives YOU the Most from Heat

THE STORY OF ZIRCONIUM



MULTI-LINGUAL

1 Ancient Persians used the word "zargun" to mean gold-colored. The term "zargun" has become "zircon" through the Arabic, Portuguese, and French languages. The mineral zircon has yielded the element "zirconium," first isolated in 1824 by the Swedish chemist Berzelius.



OF MINES AND MEN

2 From deposits in the United States, Australia, South America, and other parts of the world, ores travel great distances to electric furnaces where they are converted to zirconium alloys. But first the clay and slimes are washed from the ore, as shown in this South American mining scene.

EXPERIMENT TO EXPERIENCE

3 Prior to the entrance of the United States into the first World War, Electromet was conducting experimental work on zirconium alloys, and was able to produce these alloys in large quantities. Again, throughout World War II, Electromet met far greater requirements for zirconium.

VERSATILE PERFORMER

4 Zirconium alloys are of great service to the steelmaker. Not only is zirconium a powerful deoxidizer, but it is extremely reactive with nitrogen and sulphur as well. Generally used as a ladle addition, zirconium alloys are sometimes added to the bath when steel is made in electric furnaces.

GREAT FOR TOUGHNESS

5 For high-strength steel parts which must be cold-formed, zirconium is important. Rock drills, rails, axles, and crankshafts—all requiring maximum toughness—benefit by additions of zirconium alloys because of their thorough deoxidation and cleansing effect. Depth hardenability is increased.

Questions on Alloys?

Electromet produces alloys of 12 to 15 per cent and of 35 to 40 per cent zirconium, as well as other special zirconium-containing alloys. To aid ferro-alloy users in selecting the proper alloy for their needs, Electromet's staff of experienced metallurgists stands ready to assist you. An explanation of this unique service, and descriptions of Electromet products are included in the booklet, "Electromet Ferro-Alloys and Metals," available by writing our Technical Service Department.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

ELECTROMET Ferro-Alloys and Metals are sold by Electro Metallurgical Sales Corporation, and Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Electromet

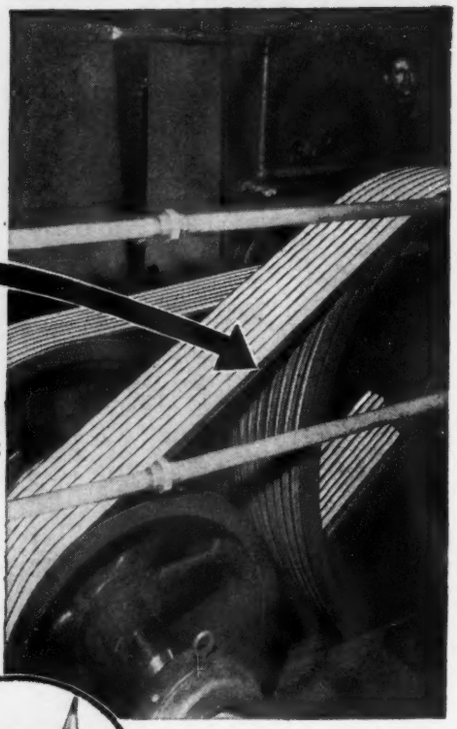
TRADE-MARK

Ferro-Alloys & Metals

You See at Once That the SIDE of a V-BELT

is the part that GETS the WEAR

DIAGRAM OF V-BELT IN SHEAVE



Naturally so, because the sides of a V-belt do all the gripping on the pulley. They get all the wear against the sheave groove wall.

It's the sides, too, that pick up all the power delivered by the driver pulley. The sides transmit that power to the belt as a whole. And then, once more, it's the sides--and the sides alone--that grip the driven pulley and deliver the power to it.

That is why you have always noticed that the sidewall of the ordinary V-Belt is the part that wears out first.

---and Now See How the CONCAVE SIDE

(A GATES PATENT)

✓ REDUCES Sidewall WEAR Greatly Lengthening Belt Life!

Clearly, since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will lengthen the life of the belt.

The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the middle of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

✓MORE Important NOW Than ever Before!

Now that Gates Specialized Research has resulted in V-Belts having much stronger tension members -- tension members of Rayon Cords and Flexible Steel Cables, among others--the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall the life-prolonging Concave Side is more important today than ever before!

THE GATES RUBBER COMPANY, DENVER, U. S. A.
World's Largest Makers of V-Belts

Straight Sided V-Belt

FIG. 1

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

FIG. 1-A

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

FIG. 2

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley

FIG. 2-A

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

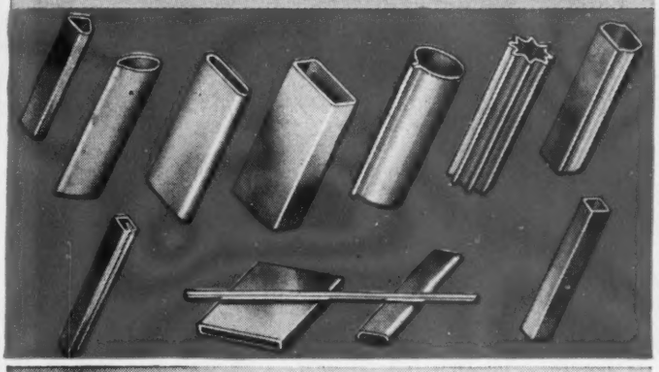
472

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

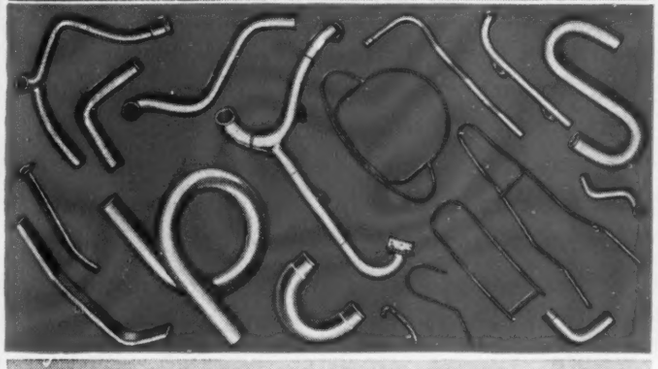
Gates — THE MARK OF SPECIALIZED RESEARCH

"STANDARDIZE WITH STANDARD"

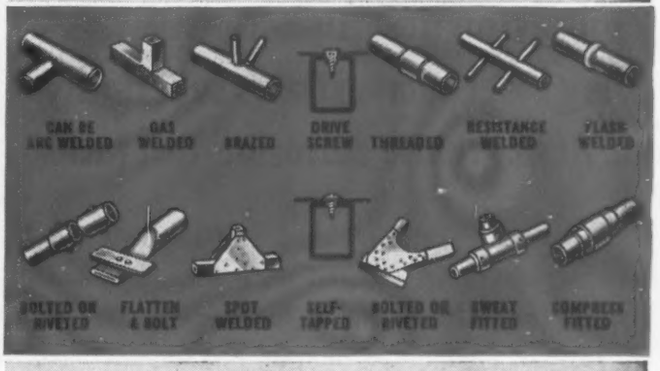


"Standard" Tubing comes in many shapes, sizes, gauges . . .

"Standard" Tubing is easy to process in many ways . . .



"Standard" Tubing is easy to bend in any direction . . .



"Standard" Tubing is easy to assemble by many methods . . .

THE STANDARD TUBE CO.
Detroit 3, Michigan
Welded Tubing
Fabricated Parts
STANDARDIZE with "STANDARD"—It Pays

STANDARDIZE WITH "STANDARD"—IT PAYS!

FOR EXAMPLE: Standard Tube Company specialists are showing the way to more and more tubing uses . . . for building interiors, as well as in other specialized fields. Manufacturers of structural and decorative building items, equipment, and furnishings are finding our suggestions profitable. Practical changes or developments frequently result in increased production or improved products by standardizing with "Standard."

Your choice of carbon steels, stainless, and N-A-X., high tensile steel of uniformly high quality . . . with a weld of the same uniform strength and physical characteristics as the tube wall itself. Let "Standard" help you simplify your design, fabrication, and assembly processes!

★ *Complete Tube Stocks Maintained by* ★

STANDARD TUBE SALES CORP., One Admiral Ave., Maspeth, L. I., N. Y.
LAPHAM-HICKEY COMPANY, 3333 W. 47th Place, Chicago 32, Ill.
UNION HARDWARE & METAL CO., 411 E. First St., Los Angeles 54, Cal.
THE PACIFIC PIPE COMPANY, 160 Spear St., San Francisco 5, Cal.

Youngstown's High-Tensile Low-Alloy Steel demonstrates superiority on Atmospheric corrosion-test racks

THE "gridiron" shown above is a battery of test racks located on the Eastern seacoast of the United States. Hundreds of samples of various steels and metals are exposed on these racks to severe marine atmosphere and are examined periodically to compare the results of various samples. Similar racks are placed in industrial and rural locations.

On these racks and in actual service tests, Youngstown's high-tensile low-alloy steel, familiar to steel users everywhere as "Yoloy," has proven itself to resist corrosion several times better than mild carbon steels.

This unusual ability of Yoloy steels to resist corrosion is due to the influence of its nickel and copper content. These same two constituents give Yoloy other valuable properties--extra tensile strength, added impact strength at low temperatures, good ductility, easy weldability, and increased resistance to abrasion.

Whenever you have an extra tough job for steel, or where you want to reduce dead weight without impairing strength consider Yoloy--the steel that's tested and proved in the laboratory of time. Let us discuss your requirements for future construction.

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

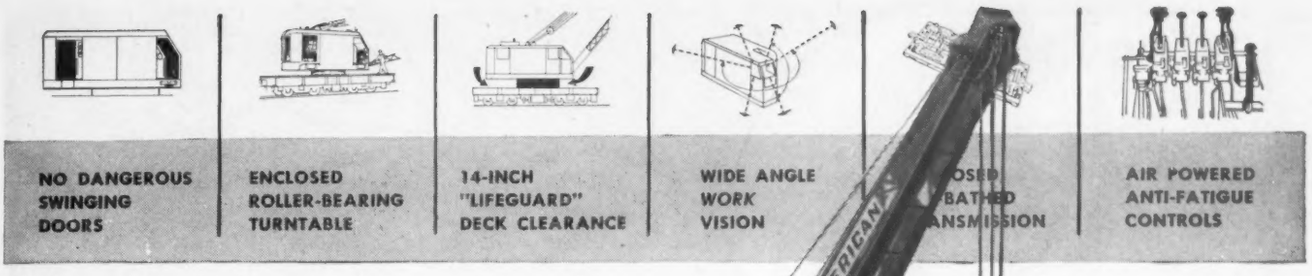
GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

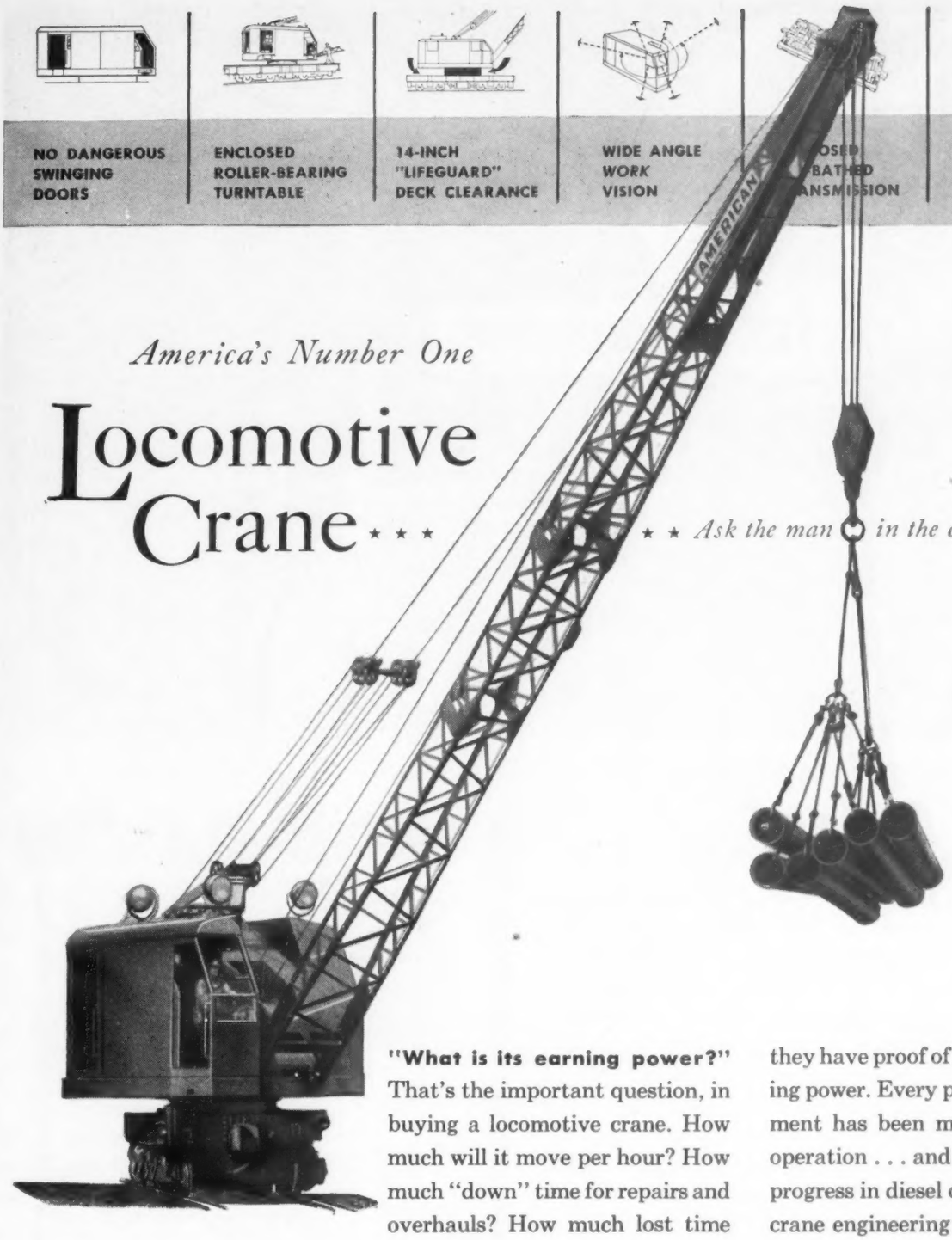
Sheets - Plates - Pipe and Tubular Products - Bars - Rods - Wire - Cold Drawn Carbon Steel Rounds - Tie Plates and Spikes - Conduit - Electrolytic Tin Plate - Coke Tin Plate.



America's Number One

Locomotive Crane ★ ★ ★

★ ★ *Ask the man in the cab!*



"What is its earning power?" That's the important question, in buying a locomotive crane. How much will it move per hour? How much "down" time for repairs and overhauls? How much lost time due to operator fatigue?

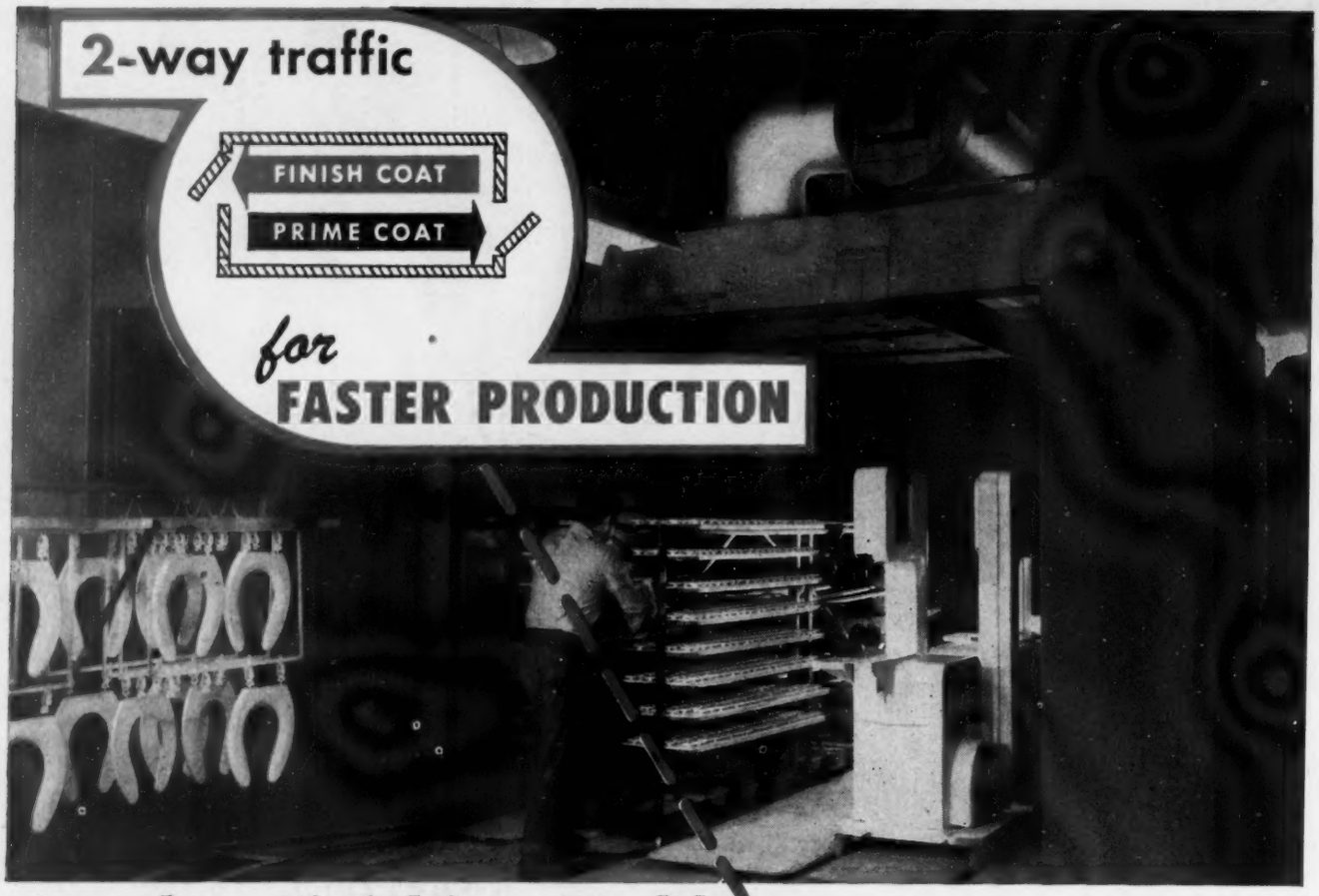
Users of AMERICAN Locomotive Cranes habitually reorder because they have proof of maximum earning power. Every possible improvement has been made for ease of operation . . . and the sum total of progress in diesel or diesel-electric crane engineering is yours in any AMERICAN model you select. Let us tell you the whole story, with facts and figures.

Plant No. 2
SO. KEARNY, N. J.
Sales Offices:
NEW YORK
PITTSBURGH
CHICAGO
NEW ORLEANS
SAN FRANCISCO

732

American Hoist
and DERRICK COMPANY

St. Paul 1, Minnesota



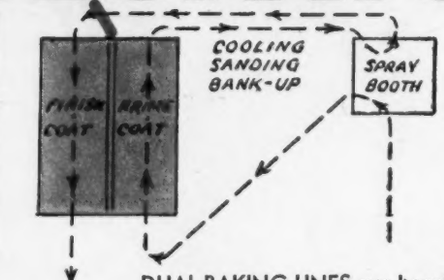
Another Finishing Problem—
Licked by DESPATCH

Baking prime and finish coats at the same time, on load lines running in opposite directions, this DESPATCH Batch Oven makes "2-way traffic" really pay! Material flow is faster, handling is simplified and per-unit finishing costs kept down.

Large double doors at both ends of oven make "2-way traffic" an easy matter—a typical result of applying 45 years experience to get the right finishing equipment for a customer. This oven offers new convenience in use . . . it saves floor space . . . can handle more production . . . and it assures low operating costs for quality finishes.

WRITE TODAY! Let DESPATCH tackle your finishing problem! We are still breaking records for prompt delivery and can save you delay and expense in providing the right equipment for your finishing needs.

DESPATCH OVEN CO., 617 S.E. 8th Street, Minneapolis 14, Minn.



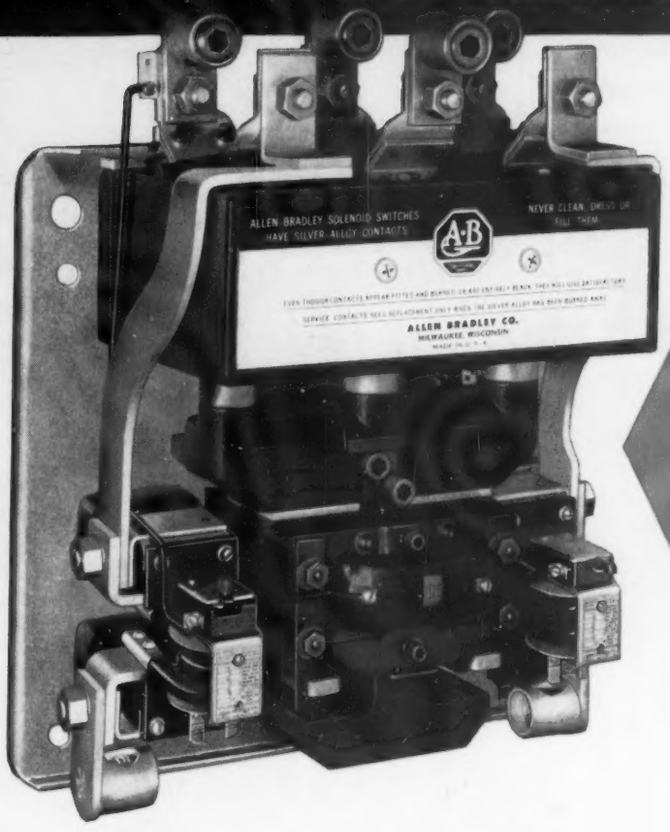
DUAL BAKING LINES are handled simultaneously in the Despatch Oven shown above. Products are cleaned and rustproofed in adjacent area, then moved to spray booths for prime and finish coats. Arrows show production flow.

High speed forced convection heat assures rapid, uniform baking of capacity loads. It is ideal for all finishes and guarantees high quality results with maximum economy.

DESPATCH
OVEN COMPANY

Complete FINISHING SYSTEMS or Separate Ovens
BAKE OVENS • DRYERS • AIR CONDITIONERS
RUSTPROOFERS • SPRAY BOOTHS • WASHERS
FLOW COATERS • CONVEYORS

ON TEST. 5,721,098 OPERATIONS *before failure!*



NEW SIZE 5 Bulletin 709 SOLENOID STARTER Shows Amazing Ruggedness in Life Tests

Now . . . Solenoid Construction . . . with all its Advantages . . . in a 300-Ampere Starter

In actual mechanical life test, the new Allen-Bradley Size 5 solenoid starter operated 5,721,098 times before a minor failure occurred. This amazing test proves the inherent ruggedness and long life of this new solenoid starter—a life span heretofore unheard of in a 300-ampere starter!

The New Size 5 solenoid starter has all the proved advantages of Allen-Bradley solenoid design—simple construction . . . maintenance-free, double break, silver alloy contacts . . . compact, self-contained switch mechanism This starter will bring you the same astounding results in a 300-ampere switch as you have been enjoying in Allen-Bradley solenoid starters of smaller capacity. Therefore, for your large motors, specify this new solenoid starter.

Bulletin 709, Size 5 solenoid starter in its attractive, NEMA Type 1, sheet metal enclosure with white interior.

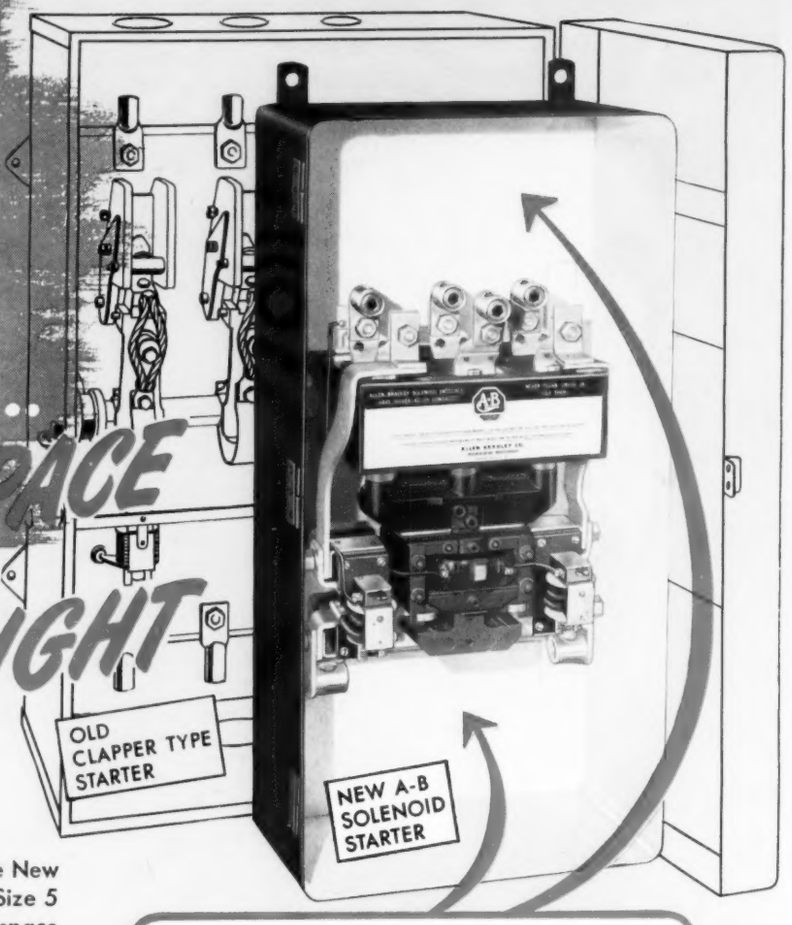
A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

NEW SIZE 5
Bulletin 709 SOLENOID STARTER takes...

46% LESS SPACE
50% LESS WEIGHT



Put a conventional clapper type starter up against the New Size 5 solenoid starter. Notice the difference! The New Size 5 is much smaller and lighter. Yet it provides much more space for wiring, and will outperform the clapper starter. It is more rugged and reliable . . . has a greater current interrupting capacity . . . is easier to install . . . is practically maintenance-free. Each pole of the New Size 5 solenoid starter is enclosed in an individual arc chamber which confines the arc and prevents flashover. This new unit will easily interrupt ten times its maximum horsepower rating. Following are a few of its other advantages:

UNIT CONSTRUCTION

All parts are assembled on a steel base plate and insulated from it. The starter can be mounted as a unit directly on any metal surface without extra insulation. All terminals are readily accessible from the front.

NO CONTACT MAINTENANCE

Patented double break, silver alloy contacts are used. Oxides that may form on these contacts are good electrical conductors. Hence, they never require filing or dressing, and valuable contact life is not wasted.

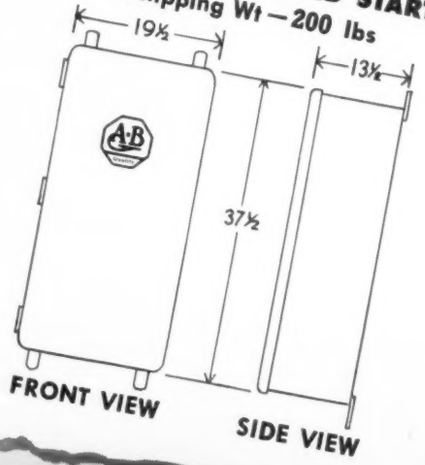
ONLY ONE MOVING PART

The only moving part in this starter is the solenoid plunger which moves up and down in a phosphor bronze guide, practically without friction. There are no pins, pivots, or hinges to corrode or gum up. No flexible jumpers to cause trouble or delay switch action.

Allen-Bradley Company
1316 S. Second St., Milwaukee 4, Wisconsin

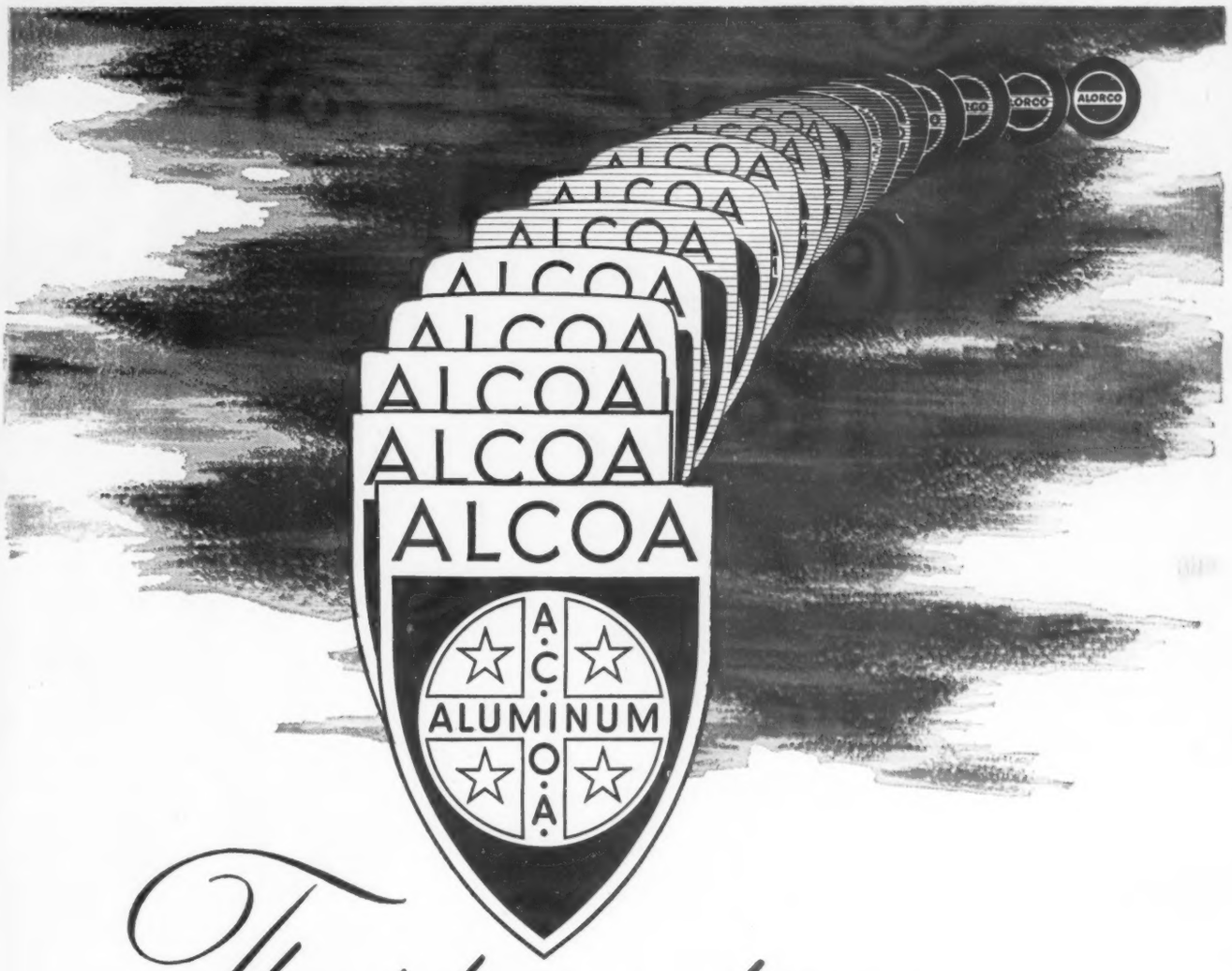
LARGER SPACE FOR WIRING, TOO

NEW SIZE 5 SOLENOID STARTER
Shipping Wt — 200 lbs



A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL



There's been a change

The same top quality Aluminas and Fluorides—produced by the Aluminum Ore Company, and for years sold under the "Alorco" brand name and trade-mark—now carry the ALCOA trade-mark. They will be marketed exclusively by the Chemicals Division of Aluminum Company of America.

Just as the ALCOA shield has long been the symbol for the best in aluminum—so now look to it for the best in aluminas and fluorides.

ALCOA ALUMINAS are versatile chemicals. They are used as hard-biting abrasives . . . as high temperature refractories . . . as catalyst carriers . . . for drying gases and liquids . . . and employed in dozens of other ways. More likely than not, the spark plug "porcelains" in your car are made of *Alcoa Alumina*.

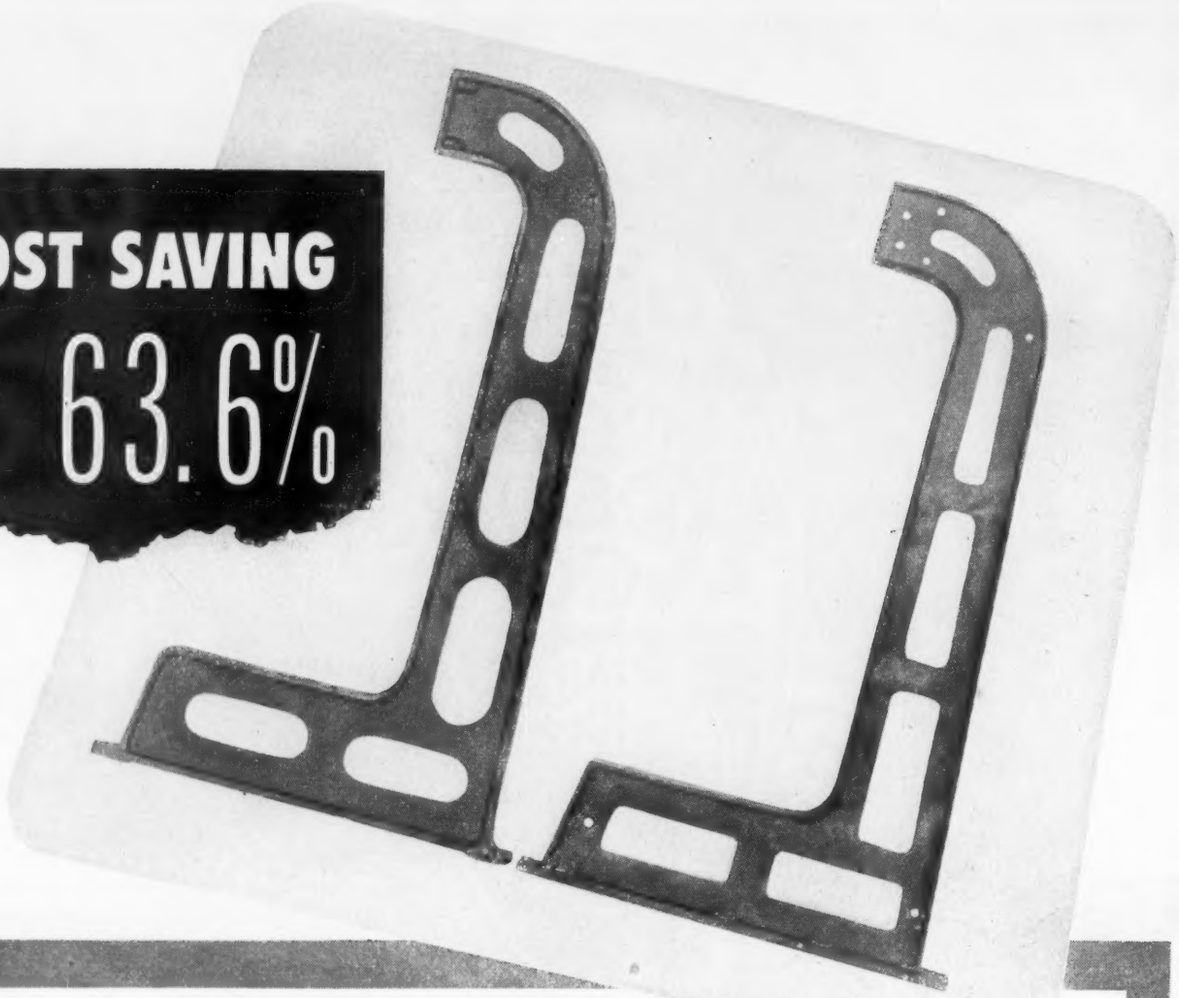
ALCOA FLUORIDES are used in many ways . . . for laundry compounds . . . for preserving wood . . . and as *Alcoa Cryolite Insecticide* to protect both farm and orchard crops. Let us tell you how these Alcoa products can serve you. Call your nearest Alcoa sales office, or write ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 1782 Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA

ALCOA *Aluminas and Fluorides*

FORMERLY SOLD UNDER THE TRADE NAME "ALORCO"

COST SAVING 63.6%



Steel castings engineers are practical people. They know that neither the casting process nor any other process always has the answer when it comes to producing quality steel parts economically.

But there are many instances in industry where casting does afford big savings in production costs, often with greater strength and ability to perform.

The fabricated saw frame (right, above) was a perfectly satisfactory part. It did its job well.

Then the one-piece cast part (left, above) was designed. It did the job equally well, yet it cost 63.6% less to make.

Steel castings do not always show savings like that, but they do it often enough to make the subject worth investigating.

The first step in building an improved product, or in cutting costs, is to plan it that way—a steel castings engineer can help you. Steel Founders' Society, 920 Midland Building, Cleveland 15, O.

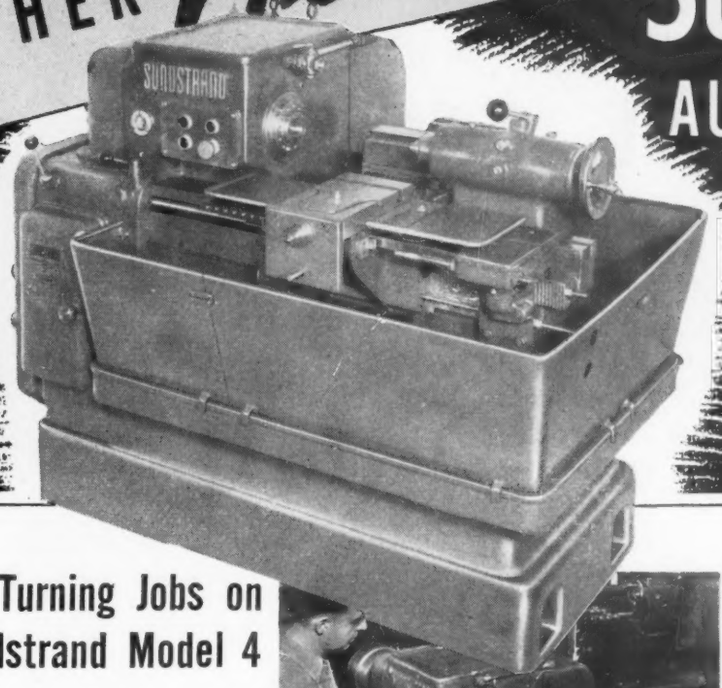
MODERNIZE AND IMPROVE YOUR PRODUCT WITH

STEEL CASTINGS

ANOTHER *New* Sundstrand AUTOMATIC LATHE

(THE MODEL 4 AUTOMATIC)

For BOTH Long and Short-Run Turning!

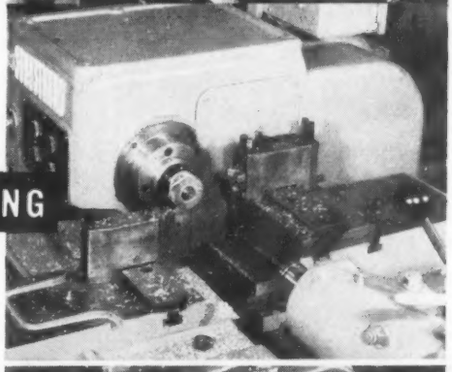


Typical Turning Jobs on the Sundstrand Model 4

Here are three typical operations being performed daily on this new lathe. Its basic design is adaptable to countless other turning operations.

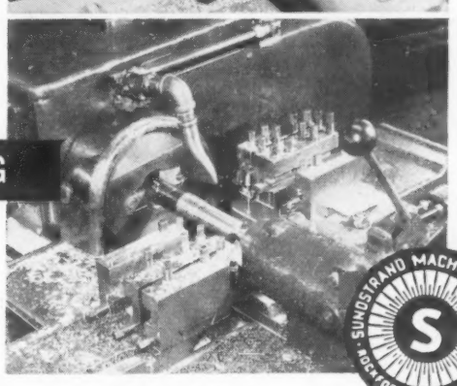
1 • SHORT-RUN TURNING

Part	Gear blanks
Material	8620 Steel
Operation	Turn, face, chamfer and drill
Lot Size	12 to 30 pieces—over 100 different sizes of parts ranging from 1½" diameter and ½" wide to 5" diameter and 1¾" wide
Machine	Model 4 x 15 Automatic Lathe with 30 to 1800 R. P. M. speed range.



2 • HIGH-SPEED TURNING

Part	Main bearing assembly for Outboard Motor.
Material	Aluminum Die Casting
Speed	1535 R. P. M.
Feed	.0015" per rev.
Operation	Turn O. D. and chamfer
Production	Approximately 100 pieces per hour.
Machine	Model 4 x 15 Automatic Lathe with 60 to 3600 R. P. M. speed range.
Accuracy	.0005" runout .0002" taper.



3 • LONG-RUN TURNING

Part	Clutch shafts
Material	4140 Steel
Operation	Turn two diameters, chamfer and form radius
Production	Approximately 100 pcs. per hour
Machine	Model 4 x 15 Automatic Lathe with 30 to 1800 R. P. M. speed range.

Here's another fast, highly productive Sundstrand Automatic Lathe. Like our larger machines, the Model 4 has the Sundstrand quick cycle change-over plus additional new productive features. Although it is our latest, the Model 4 Automatic Lathe has been tested thoroughly on the job and on a variety of work pieces. Investigate the features of this lathe for *your* turning job.

•

Here Are a Few Outstanding Features of This New Lathe

- ✔ Basic design adaptable to wide variety of workpieces.
- ✔ Screw feed to front carriage.
- ✔ More convenient for setting up.
- ✔ Efficient chip disposal.
- ✔ Styled for ease of operation.

WRITE FOR FREE ADDITIONAL INFORMATION

A new booklet describing the features of this machine is now being printed. Complete data covering available cycles and specifications included. Write for your copy today. Ask for Bulletin No. 757.

SUNDSTRAND MACHINE TOOL COMPANY

2540 Eleventh St. • Rockford, Ill., U.S.A.

RIGIDMILS • AUTOMATIC LATHES • SPECIAL MILLING AND TURNING MACHINES

YOU BUY TIME ... *by the Second!*

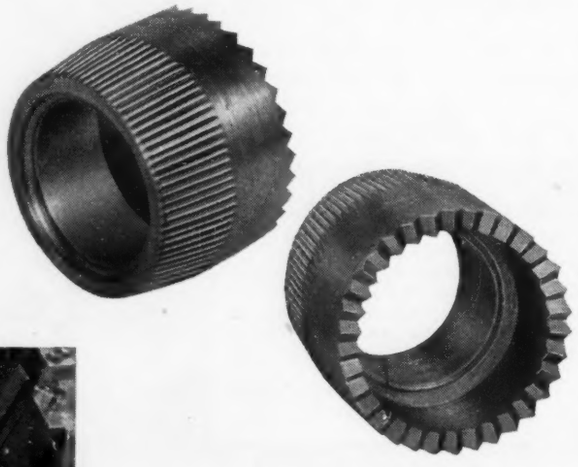
Seconds are worth more nowadays. They cost two or three times more to buy than they used to cost.

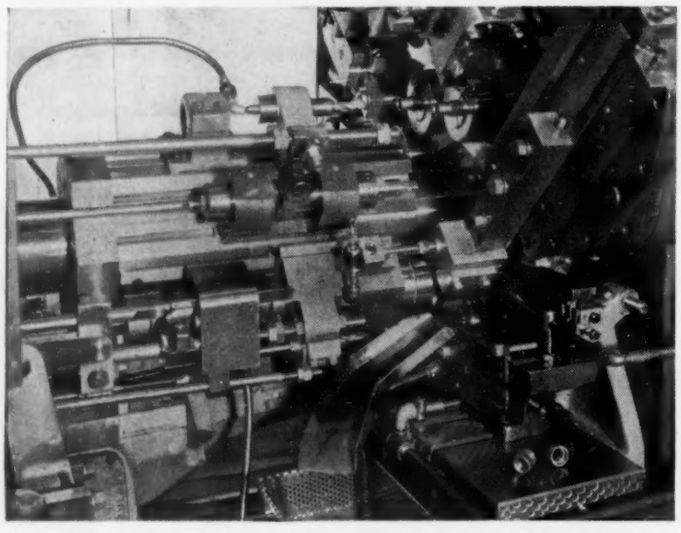
And they are worth more — for modern automatic machines work faster and get more done.

That's why we put so much stress on *machine time.* It is the major controllable factor in the cost of parts.

Material costs and hourly wage rates tend to equalize. Time of production is the one cost factor you can reduce, by using Acme-Gridley Automatic methods and equipment.

This is not mere theory. We can prove it with facts on thousands of production jobs. Feel free to write us for an Acme-Gridley cost estimate on any metal part you produce in quantities.

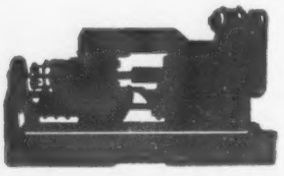




Here is a typical example:

The bicycle sleeve clutch shown is $1\frac{1}{8}''$ diameter, turned from SAE 5115 bar stock on an Acme-Gridley 6 Spindle Bar Automatic. Fifteen separate operations are required, 34 equally spaced ratchet teeth, including pick-off and counterbore back end.

Machine time per part is 13.7 seconds—262 completed parts per hour.

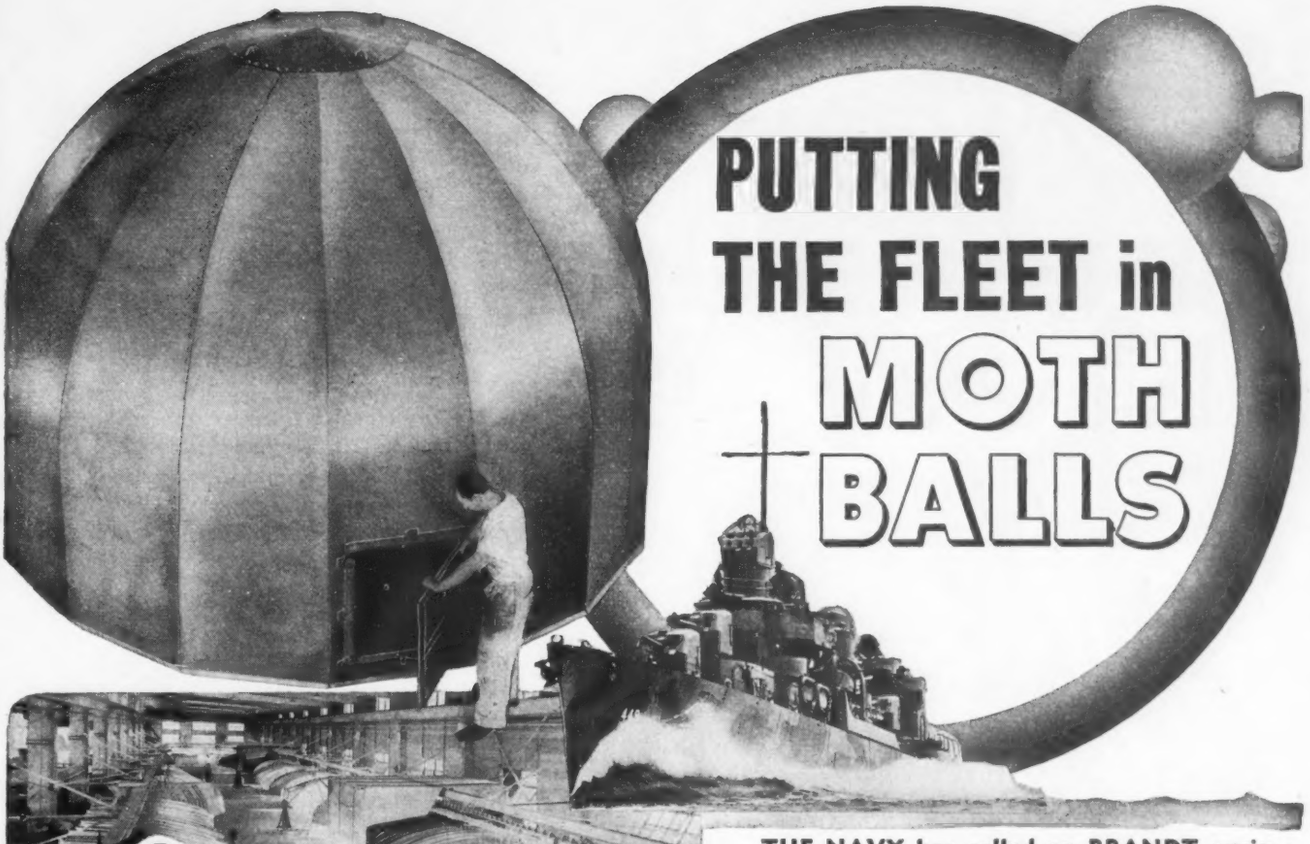


THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
Maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

PUTTING THE FLEET in MOTH BALLS

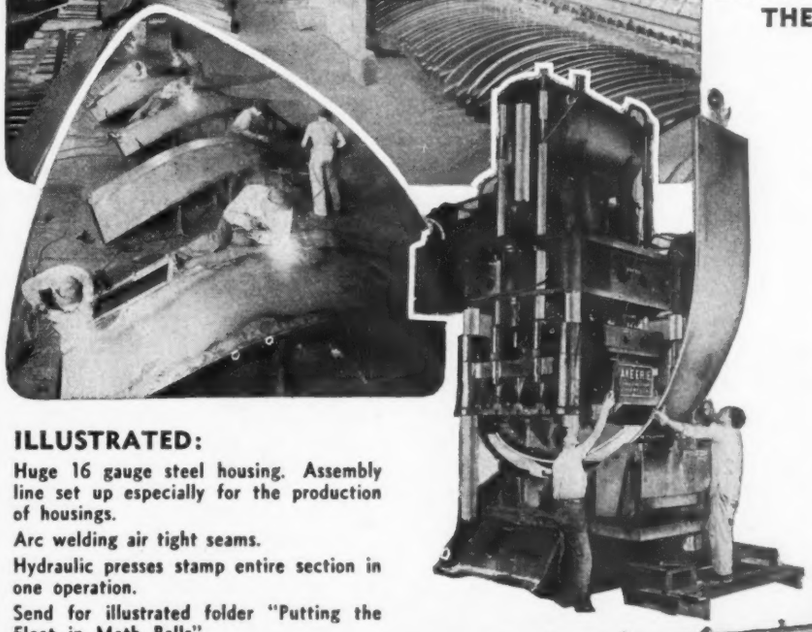


THE NAVY has called on BRANDT again.

This time to build steel "Cans for Guns", . . . air tight protective structures for the preservation of valuable armament. These 16 gauge steel housings, 13 feet high by 15 feet in diameter, are being **mass produced** on an assembly line basis by Brandt.

"Time", being the essence of this contract, mass production methods are being applied to all operations including: Stamping, Forming, Arc and Spot Welding, Bonderizing, Painting, Assembling and Crating . . . all under the same roof.

These units, which are made in their entirety by Brandt, attest to the wide range of Brandt Specialized Metal Working facilities.



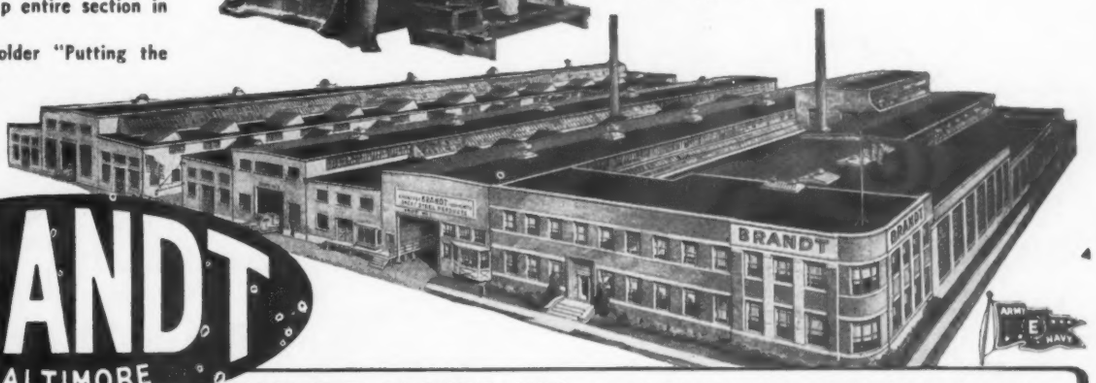
ILLUSTRATED:

Huge 16 gauge steel housing. Assembly line set up especially for the production of housings.

Arc welding air tight seams.

Hydraulic presses stamp entire section in one operation.

Send for illustrated folder "Putting the Fleet in Moth Balls".



BRANDT
BALTIMORE

CHARLES T. BRANDT, INC., 1700 RIDGELY ST., BALTIMORE-30, MD.

Precision METAL CRAFTSMEN SINCE 1890 ★ ★ ★ ★

FACTS YOU SHOULD KNOW ABOUT ELECTRODES

Are you familiar with the mechanical properties of electrodes? . . . Do you know the different types of electrodes for welding cast iron — mild steel—high tensile, low alloy steels . . . which electrode will do the job better, faster — at less cost?

This, and other vital information is all contained in Airco Catalog No. 120. Compiled by leading technicians in the field, this definitive work gives authentic, understandable information on electrodes . . . application, welding procedure, mechanical properties and specifications are thoroughly covered.

Every metal man will find almost daily use for this big, helpful manual. It will save him time, effort and needless worry. It will answer almost any question regarding the proper electrode for welding any particular base metal — for any given type of work.

Send for this valuable, informative guide today! Just fill in the coupon, and mail it to: Air Reduction, General Offices, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices, Houston 1, Texas. Represented Internationally by Airco Export Corporation.

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HEADQUARTERS FOR OXYGEN, ACETYLENE, AND OTHER GASES...CARBIDE...GAS WELDING AND CUTTING APPARATUS AND SUPPLIES . . . ARC WELDERS, ELECTRODES AND ACCESSORIES

STANDARDS and SPECIALS by the *Millions*

THE FERRY CAP & SET SCREW CO.

2159 SCRANTON ROAD • • • CLEVELAND 13, OHIO

"SHINYHEADS"
America's Best Looking Cap Screw

Made of high carbon steel—AISI C-1038—to standards for full finished hexagon head cap screws. Heads completely machined top and bottom. Hexagon faces clean cut, smooth and true, mirror finish. Carried in stock.

"HI-CARBS"
Heat Treated Black Satin Finish

Made of high carbon steel—AISI C-1038. Furnished with black satin finish due to heat treatment. Hexagon heads die-made, not machined. Point machine turned; flat and chamfered. Tensile strength 130,000-160,000 p.s.i. Carried in stock.

FILLISTER CAP SCREWS

Heads completely machined top and bottom. Milled slots—less burrs. Flat and chamfered machine point. Carried in stock.

FLAT HEAD CAP SCREWS

Heads completely machined top and bottom. Milled slots—less burrs. Flat and chamfered machine point. Carried in stock.

"SHINYLAND" STUDS

All studs made steam-tight on tap end unless otherwise specified, with flat and chamfered point. Nut end, oval point. Carried in stock.

SET SCREWS

Square head and headless—cup and oval point—case hardened. Carried in stock.

"SHINYTHREADS"
AIRCRAFT ENGINE STUDS

Made of highest aircraft quality alloy steel, finished to extremely close thread and body tolerance, with precision rolled threads—both straight and step types.

CONNECTING ROD BOLTS

Made of alloy steel—heat treated—threads rolled or cut—finished to extremely close thread and body tolerances—body ground where specified.

SPRING BOLTS

Case hardened to proper depth and ground to close tolerances. Thread end annealed. Supplied in various head shapes, with oil holes and grooves of different kinds, and flats accurately milled.

VALVE TAPPET ADJUSTING SCREWS

Hexagon head style—to blueprint specifications—hexagon head hard; polished if specified—threads soft to close tolerance.

STANDARDS carried by LEADING DISTRIBUTORS

SPECIALS furnished to BLUE PRINT SPECIFICATIONS

TO SAVE TIME AND COST *Simply Specify* **"SHINYHEADS"** NC or NF Thread | **"HI-CARBS"** NC or NF Thread

Pioneers and Recognized Specialists, Cold Upset Screw Products since 1907

WRITE FOR INFORMATION • SEND FOR SAMPLES •

FIRST AID FOR AILING MOTORS

Look at the BEARINGS

Electric Motors grow *lazy* too! Long hours of steady operation plus frequent overloads lower efficiency . . . increase power consumption. Before you blame the motor take a look at the bearings.

The bearing is one of the most vital parts of a motor. Only when the bearings are correct in design, properly installed, and adequately lubricated, do you get top efficiency. When replacement is necessary specify Johnson E M (Electric Motor) Bearings. From our list of over 250 stock sizes it is easy to secure your needs. Every bearing is correct in design, alloy, and tolerance. Our new catalogue describes this complete service in detail. Why not write for a copy today? Johnson Bronze Company, 550 South Mill Street, New Castle, Pennsylvania.

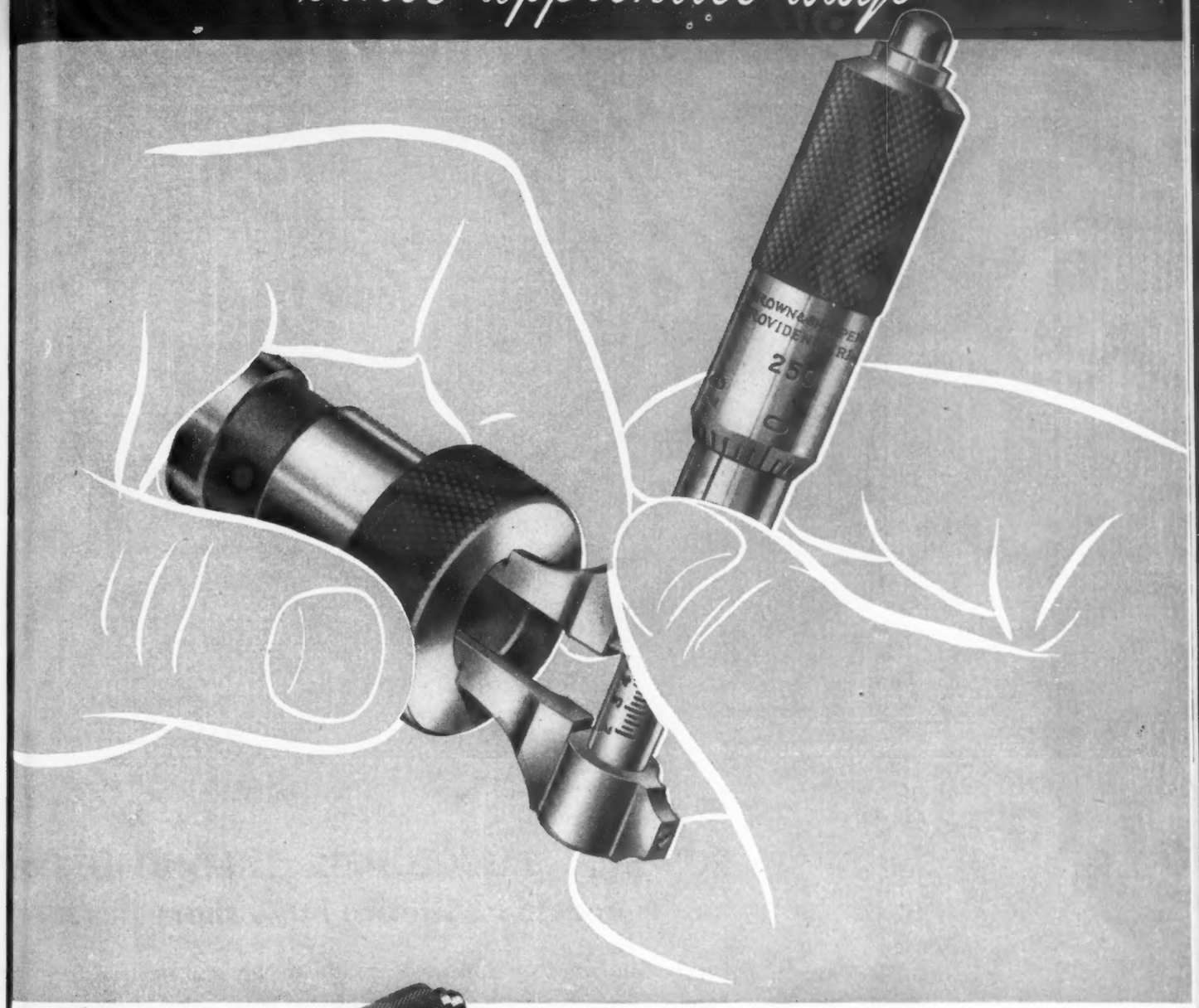
Manufacturers

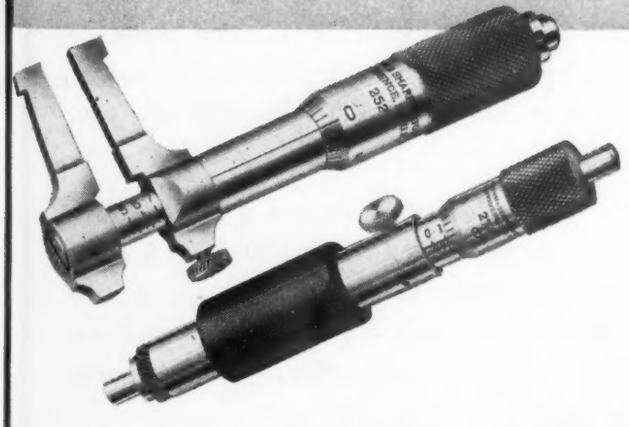
of Electric Motors find Johnson Bronze a dependable source of supply for all their Sleeve Type Bearings. We help them make the correct choice . . . we deliver their requirements strictly to specifications. Our advice is available without obligation.

JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
BRANCHES IN 18 INDUSTRIAL CENTERS
For REPLACEMENT Specify JOHNSON EM ELECTRIC MOTOR BEARINGS

PRIDE OF THE MACHINIST

since apprentice days





Inside Micrometers, Nos. 252 and 270, shown above, are a part of the wide line of Brown & Sharpe Machinists' Tools which include rules, combination squares, bevel protractors, straight edges, vernier tools, dial test indicators and many others.

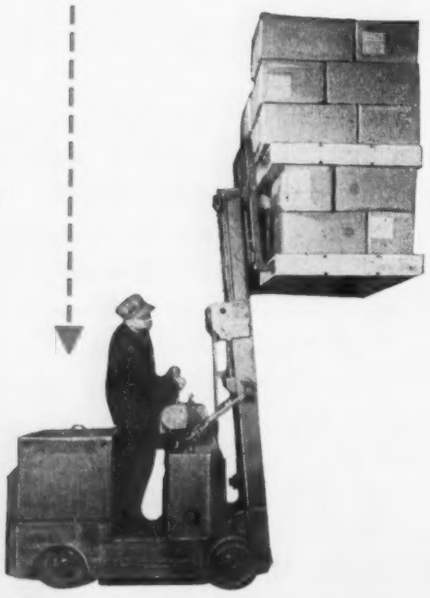
We urge buying through the Distributor

• Whether it's the machinist's own micrometer or one issued to him from the tool crib, a Brown & Sharpe tool is an old friend. That's more than familiarity. It is respect for a tradition of fine precision tool making that goes back almost to the beginning of American industry. It is the knowledge of how precisely Brown & Sharpe makes tools . . . of such details as the end-to-end accuracy of the micrometer screw, the easily read graduations and figures and the care that's taken to make accuracy last through the long life of the tool. Such tools have always been the wisest possible tool investment. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island, U. S. A.

BROWN & SHARPE TOOLS

DEPENDABLE POWER

POWER . . . RUGGEDNESS . . . LONG-LIFE
Exide-Ironclad Batteries have them all . . .



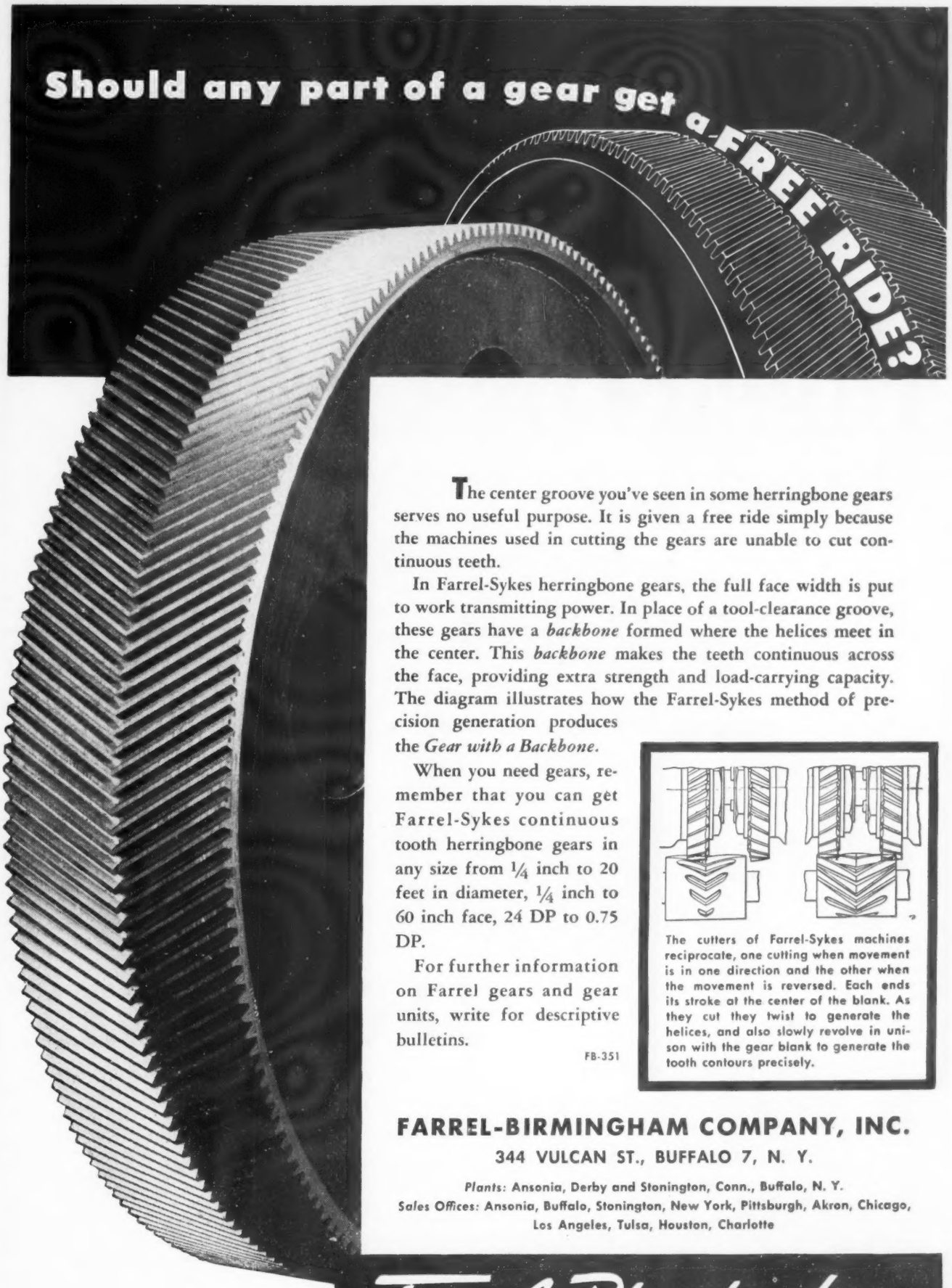
Production goes up and costs go down when materials are handled by the efficient, time-saving Exide-Ironclad powered electric truck. It is a combination that assures extra power, speed, ruggedness and a long-life with exceptional ease of maintenance.

Exide-Ironclads are ready and able to deliver a high rate of discharge at high voltage when needed. They assure quick starting, quick acceleration and fast movement of goods. And Exide-Ironclads are built to *take it* as well as *give it*, for their ruggedness is *all over* ruggedness . . . plates, separators, jars, *all* parts.

Write for FREE copy of Exide-Ironclad Topics which contains "Case Studies" of materials handling problems. Tells how to cut handling costs up to 50% . . . covers latest developments in handling materials from receiving to shipping.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

Should any part of a gear get a FREE RIDE?



The center groove you've seen in some herringbone gears serves no useful purpose. It is given a free ride simply because the machines used in cutting the gears are unable to cut continuous teeth.

In Farrel-Sykes herringbone gears, the full face width is put to work transmitting power. In place of a tool-clearance groove, these gears have a *backbone* formed where the helices meet in the center. This *backbone* makes the teeth continuous across the face, providing extra strength and load-carrying capacity. The diagram illustrates how the Farrel-Sykes method of precision generation produces the *Gear with a Backbone.*

When you need gears, remember that you can get Farrel-Sykes continuous tooth herringbone gears in any size from 1/4 inch to 20 feet in diameter, 1/4 inch to 60 inch face, 24 DP to 0.75 DP.

For further information on Farrel gears and gear units, write for descriptive bulletins.

FB-351

The cutters of Farrel-Sykes machines reciprocate, one cutting when movement is in one direction and the other when the movement is reversed. Each ends its stroke at the center of the blank. As they cut they twist to generate the helices, and also slowly revolve in unison with the gear blank to generate the tooth contours precisely.

FARREL-BIRMINGHAM COMPANY, INC.

344 VULCAN ST., BUFFALO 7, N. Y.

Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, Stonington, New York, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston, Charlotte

Farrel-Birmingham

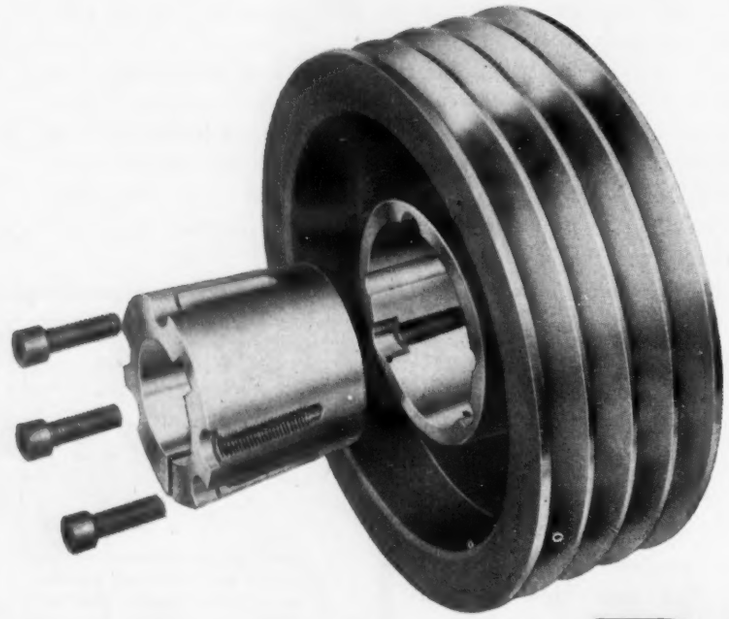
Complete unit.
Slip it on, line it up
and tighten while
sighting.

The simplest,
surest mechanism ever
devised for holding
wheels to shafts.

TAPER-LOCK BRAND

A New Cost-Saving Taper Bore Sheave

Holds fast to
the shaft with firmness
equivalent to a
shrunk-on fit.



Disengages
with less effort than
any other sheave.
Easy on. Easy off.

Complete
range of sizes in
Dual Duty (A and B);
B, C and D grooves.

DODGE

of Mishawaka, Ind.

For details about cost-saving developments in power transmission equipment, call the Transmissioneer—your local Dodge distributor. He's factory-trained, qualified to suggest ways to improve machine performance and increase production. Look for his name under "Power Transmission Equipment" in your classified telephone directory.

DODGE MANUFACTURING CORP., MISHAWAKA, INDIANA

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NAME PLATES

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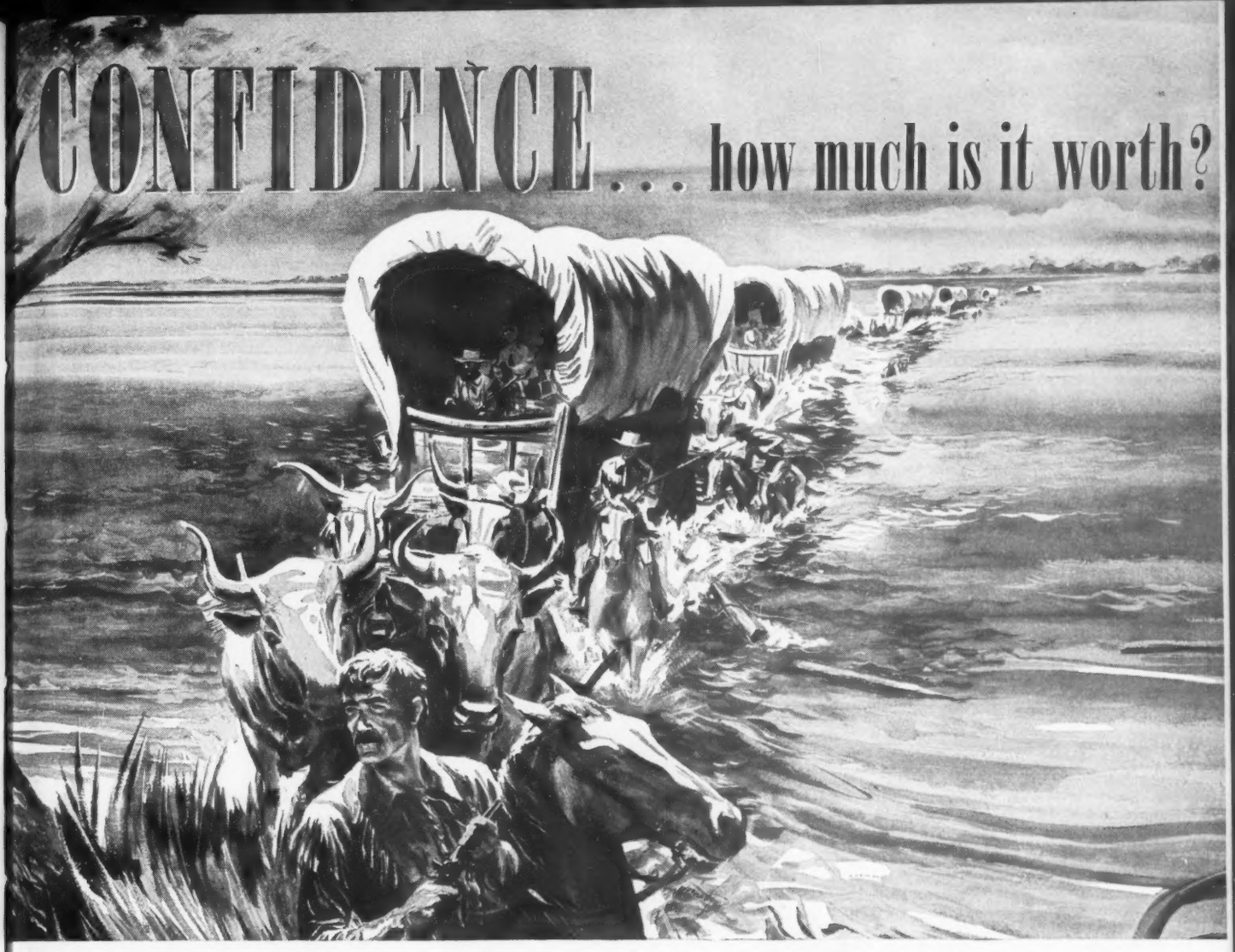
CONFIDENCE... how much is it worth?



IN 1844, three years before Alexander Graham Bell was born, and long before the first Prairie-Schooner crossed the Mississippi River, John August Roebling's confidence in the suspension principle of construction so impressed the engineers of the State of Pennsylvania, that they authorized him to build the world's first suspension aqueduct.

How much is his confidence worth to all the thousands of engineers who followed and to humanity in general that have benefited from his pioneering venture?

And how much is the confidence of the John A. Roebling's Sons Company in the future of American industry worth to you, that keeps Roebling development and Roebling products in the lead?

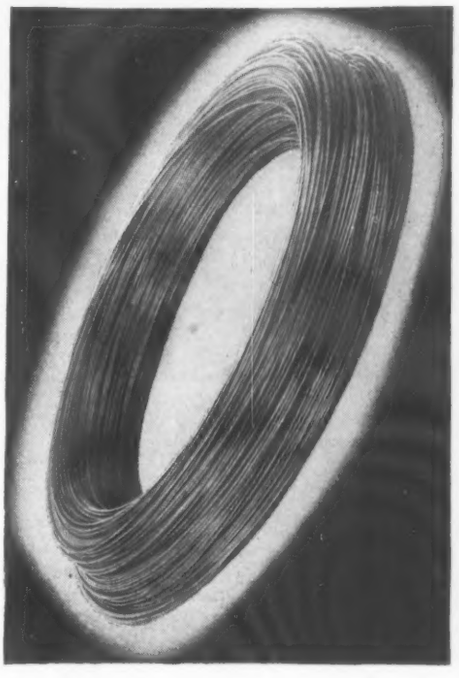
Roebling's greatest asset is your confidence in Roebling and its confidence in your future. That is why Roebling's every effort is dedicated to the preservation of this confidence—your's and Roebling's.

. . . in Roebling Spring Wire, for example . . .

Patenting and drawing high carbon steel wire is truly an art. But so, too, are the open hearth steel making, the blooming and billet mill, and the rod rolling operations.

At Roebling the importance of each of these steps is fully realized. That is why you will find that all are done in Roebling mills, by Roebling workmen. This means that the greatest possible manufacturing care can be combined with modern specialized equipment, the most exacting methods and workmanship . . . to give you wire that is absolutely uniform in grade, in temper, in finish.

Roebling spring wire will meet your toughest specifications. And remember, too, the more demanding your wire requirements the more confidence you can have that they will be met exactly—by Roebling.



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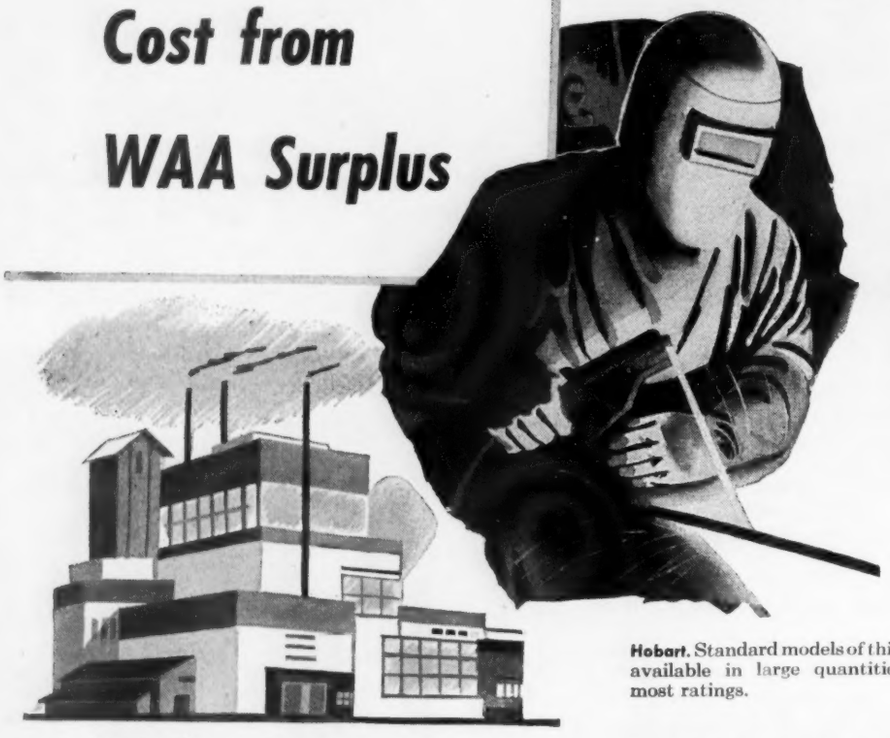
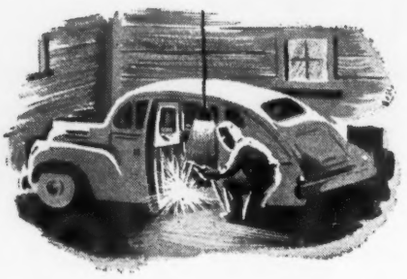
HERE'S AN ARC WELDER FOR YOUR SHOP—*At Minimum Cost from WAA Surplus*

Here are hundreds of arc welders available for immediate delivery. At WAA's low prices, no shop, however small, need be without a welder. And no shop is too big to fill its requirements from this large stock.

These are standard makes, the products of recognized manufacturers—in demand by garages, repair shops and maintenance shops and many production lines. Act today. Visit, phone or write your nearest WAA Regional Office for complete information on the availability and price of the machine you want.

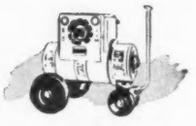
All arc welders are offered subject to prior sale.



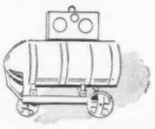


All Arc Welders are subject to priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area and then to purchase the material offered herein.

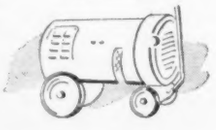
Exporters: Your business is solicited. If sales are conducted at various levels, you will be considered as a wholesaler. Any inquiries regarding export control should be referred to Office of International Trade, Department of Commerce, Washington, D. C.



Hobart. Standard models of this make available in large quantities and most ratings.



Lincoln. In all models and most ratings. Many in the popular 300-400 Ampere size.



Westinghouse. Portable models available in limited quantities. Electrodes and Welding Rods. Millions of pounds available in all types and sizes.

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BIG INTEGRAL PRESSURE FORGINGS

Pressure vessels like these are made by Midvale in an integrated plant having complete control over raw materials, forging, heat treatment and machining. This is a distinct advantage, which, together with Midvale's engineering experience, assures long and satisfactory performance in the finished forging. High pressure vessels by Midvale are promptly delivered according to schedule. Inquiries about pressure vessels of all sizes for all chemical and refining operations are invited, and information gladly given.

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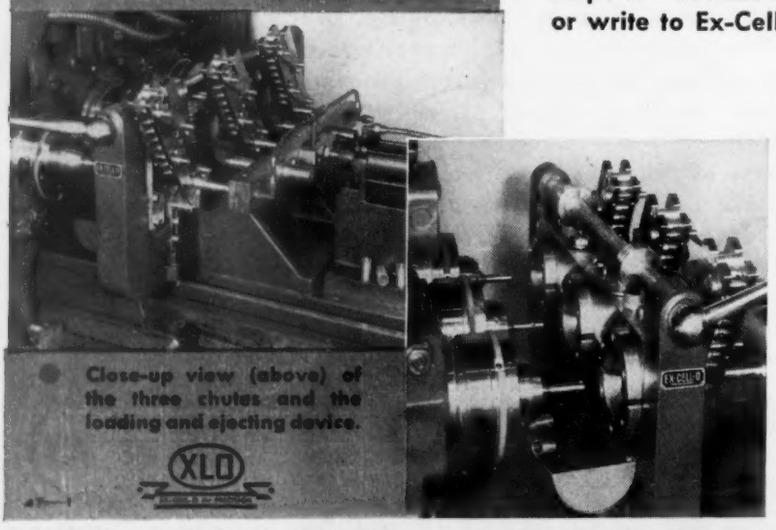
MIDVALE
Custom Steel Makers to Industry

STAINLESS AND TOOL STEEL BARS
•
CORROSION AND HEAT RESISTING CASTINGS
•
FORGINGS AND RINGS

Are material and labor costs pinning you down?

This Style 2112-A Ex-Cell-O Precision Boring Machine (above) is equipped with loading chutes and a hydraulically operated loading and ejecting device. The bushings shown in the loaded chutes are both semi-finished and finish bored at the rate of 666 pieces per hour net.



Close-up view (above) of the three chutes and the loading and ejecting device.

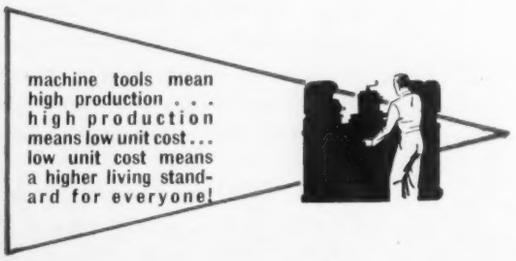
YOU CAN OFFSET THEM WITH EX-CELL-O PRECISION BORING MACHINES . . . *Here's Why:*

Ex-Cell-O Precision Boring Machines are designed to produce more parts per hour, at lower unit cost. Increased output enables you to keep up with rising labor costs; assured accuracy in the finished part also results in greater savings.

For example:

The Ex-Cell-O Style 2112-A Boring Machine illustrated here features three boring spindles, loading chutes that are filled during the boring cycle, and a hydraulically operated loading and ejecting device. The machine accommodates various size bushings up to 2″ diameter and 1¾″ long. Flexibility is obtained by adjustable loading chutes for various diameters, interchangeable clamping fixture inserts, interchangeable ends on loading and ejecting plungers, and interchangeable boring quills.

For high production at a minimum unit cost; for flexibility that permits profitable operation on a wide variety of parts—see the Ex-Cell-O representative in your locality or write to Ex-Cell-O at Detroit . . . *today!*


machine tools mean high production . . . high production means low unit cost . . . low unit cost means a higher living standard for everyone!

This view (left) shows the three boring spindles with micrometer adjustable quills for fast tool setting, and the chute (between the spindles and the fixture) into which the finished bushings are ejected.

EX-CELL-O CORPORATION

DETROIT 6 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CONTINENTAI CUTTING TOOLS • MISCELLANEOUS PRODUCTION PARTS • FUEL INJECTION EQUIPMENT • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES

back of the metal-cutting abrasives . . .

INTERNATIONAL GRAPHITE ELECTRODES

WHEREVER you see hard, metal-cutting abrasives in action, you can be reasonably certain that International Graphite Electrodes had a part in their manufacture. For leading makers of abrasives—like producers of fine alloyed metals—have learned through long experience that fine quality control of product in electric furnaces calls for perfection in every production detail. Likewise these producers have proved to their own satisfaction in the severest tests of all—in actual furnace operation under a wide range of production requirements – that International Graphite Electrodes offer the physical, electrical, and chemical properties in the right combination for their exacting needs.

Check over the qualities *you* want in electric furnace electrodes—the properties you'd give them if you were *making* electrodes as well as *using* them. You'll find, too, that International Electrodes fully measure up to every exacting standard by which electrodes are judged.

For all-around satisfaction and economical performance, specify International the next time you buy electrodes; find out first-hand why they are so widely preferred by electric furnace operators. Write for details and prices today.

Specify INTERNATIONAL Graphite Electrodes for—Slow consumption—High current capacity—Low rate of oxidation—High thermal conductivity—High degree of purity—Consistently uniform properties and dimensions—Low cost per ton of production.

International Graphite & Electrode Corp.
SAINT MARYS, PA.

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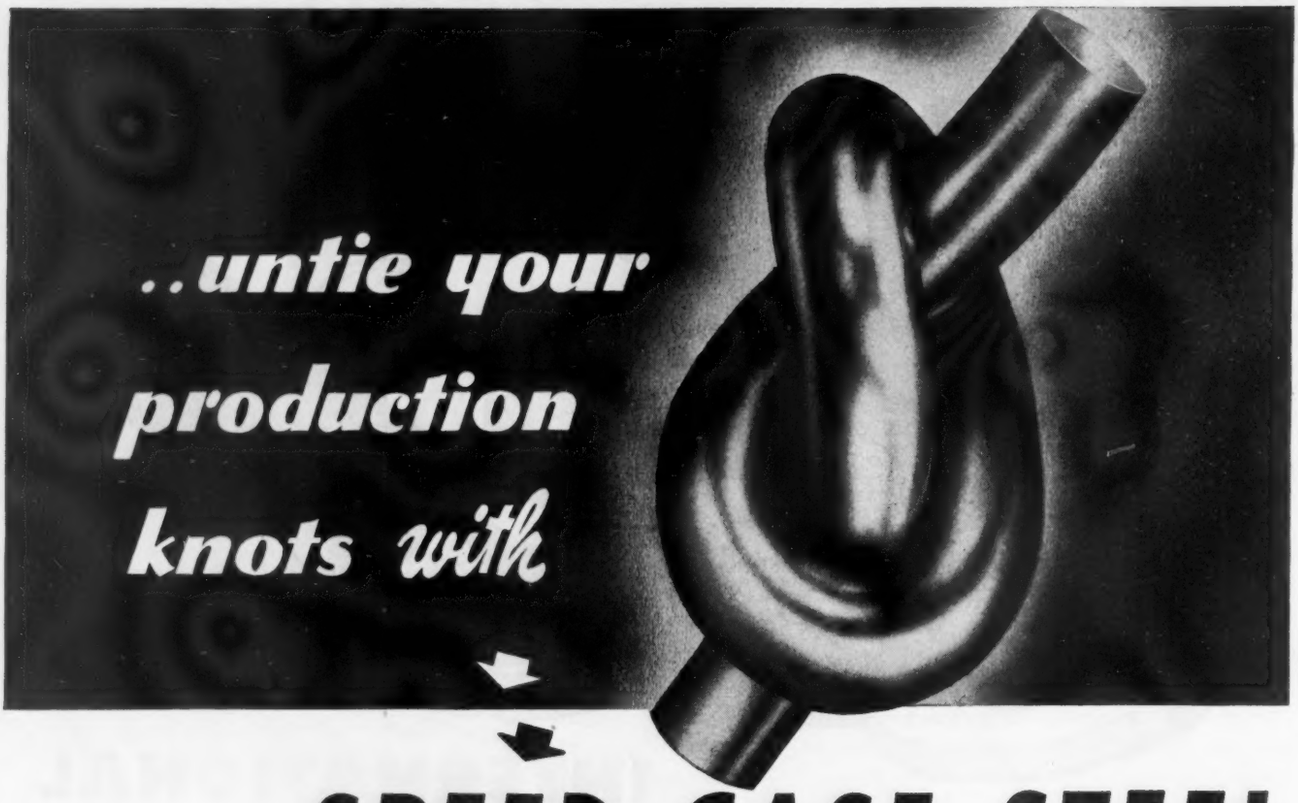

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X1515 LOW CARBON OPEN HEARTH PRODUCT

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Write us for samples. When you receive them we will send our Production Expert to you, at our expense. He will show you, in your own plant, how SPEED CASE will increase your production 30 to 100% . . . and lengthen tool life 4 to 5 times.

SPEED CASE STEEL WILL . . .

machine perfectly at 250 S.F.P.M. It will replace B1112, B1113, C1117, C1118, C1019, etc. It is so ductile it can be tied in a knot, cold, without fracture yet has a tensile of 80,000 to 90,000 PSI. It case hardens to 60-64 RC. Send for samples. Be ready for SPEED CASE when SPEED CASE is ready for you.

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PECKOVER'S LTD. Toronto, Canadian Distributor

MANUFACTURERS OF A COMPLETE LINE OF COLD FINISHED CARBON AND ALLOY STEEL BARS

Licensee for Eastern States

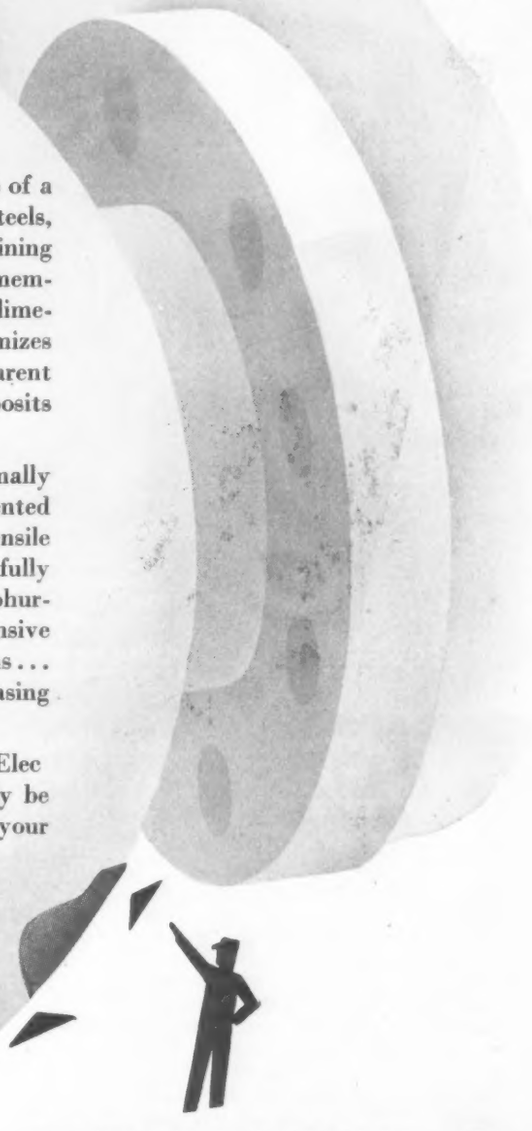
THE FITZSIMONS COMPANY

YOUNGSTOWN, OHIO

ACTUAL PHOTOGRAPH

Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.

HARD-TO-WELD STEELS ARE EASY-TO-HANDLE FOR MUREX TYPE HTS ELECTRODES



A "hard-to-weld" steel is a rare item in the life of a Murex Type HTS Electrode. High-carbon steels, cold rolled steels, and even "dirty" steels containing various impurities, are made to order for this member of the Murex Electrode family. This special lime-coated rod has a less penetrating arc that minimizes pick-up of undesirable elements from the parent metal, prevents cracking and porosity, and deposits a sound, usually X-ray clean weld.

The Murex Type HTS Electrode was originally developed as a hydrogen-free rod that prevented underbead cracking in the welding of high tensile plate. It is the first electrode to be successfully applied to the welding of free machining, sulphur-bearing die steels. It has replaced the use of expensive stainless steel electrodes on many applications... and is being employed on a constantly increasing variety of jobs.

Have a Murex Representative put the HTS Elec trode through its paces in your shop. You may be amazed at what an excellent rod it is for your maintenance welding.

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Specify MO-MAX HIGH SPEED STEELS for all of your CUTTING and TURNING TOOLS

Because only MO-MAX GIVES YOU *ALL* THESE ADVANTAGES...

1. MO-MAX has superior cutting qualities.
2. The machinability of MO-MAX is unexcelled.
3. MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel.
4. MO-MAX is available in a standardized composition; also in cobalt and high vanadium varieties for special high speed steel requirements.
5. For 14 years MO-MAX has demonstrated its superiority in all types of cutting tools.

Learn all the facts! **Send for your copy of the MO-MAX Handbook, sixth edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.**

Buyer's Guide to Brands of MO-MAX

"LMW"	Allegheny Ludlum Steel Corporation
"MOHICAN"	Atlas Steels Limited
"BETHLEHEM HM"	Bethlehem Steel Company
"MO-CUT"	Braeburn Alloy Steel Corporation
"STAR MAX"	Carpenter Steel Company
"MOLITE M-1"	Columbia Tool Steel Company
"REX T-MO"	Crucible Steel Company of America
"DI-MOL"	Henry Disston & Sons, Inc.
"HI-MO"	Firth-Sterling Steel Company
"REX T-MO"	Halcomb Steel Company
"MOGUL"	Jessop Steel Company
"TATMO"	Latrobe Electric Steel Company
"MIDMAX"	The Midvale Company
"S. T. M."	Simonds Saw & Steel Company
"MO-TUNG"	Universal-Cyclops Steel Corporation
"B-N-2"	Vanadium-Alloys Steel Company
"VUL-MO"	Vulcan Crucible Steel Company

THE CLEVELAND TWIST DRILL COMPANY

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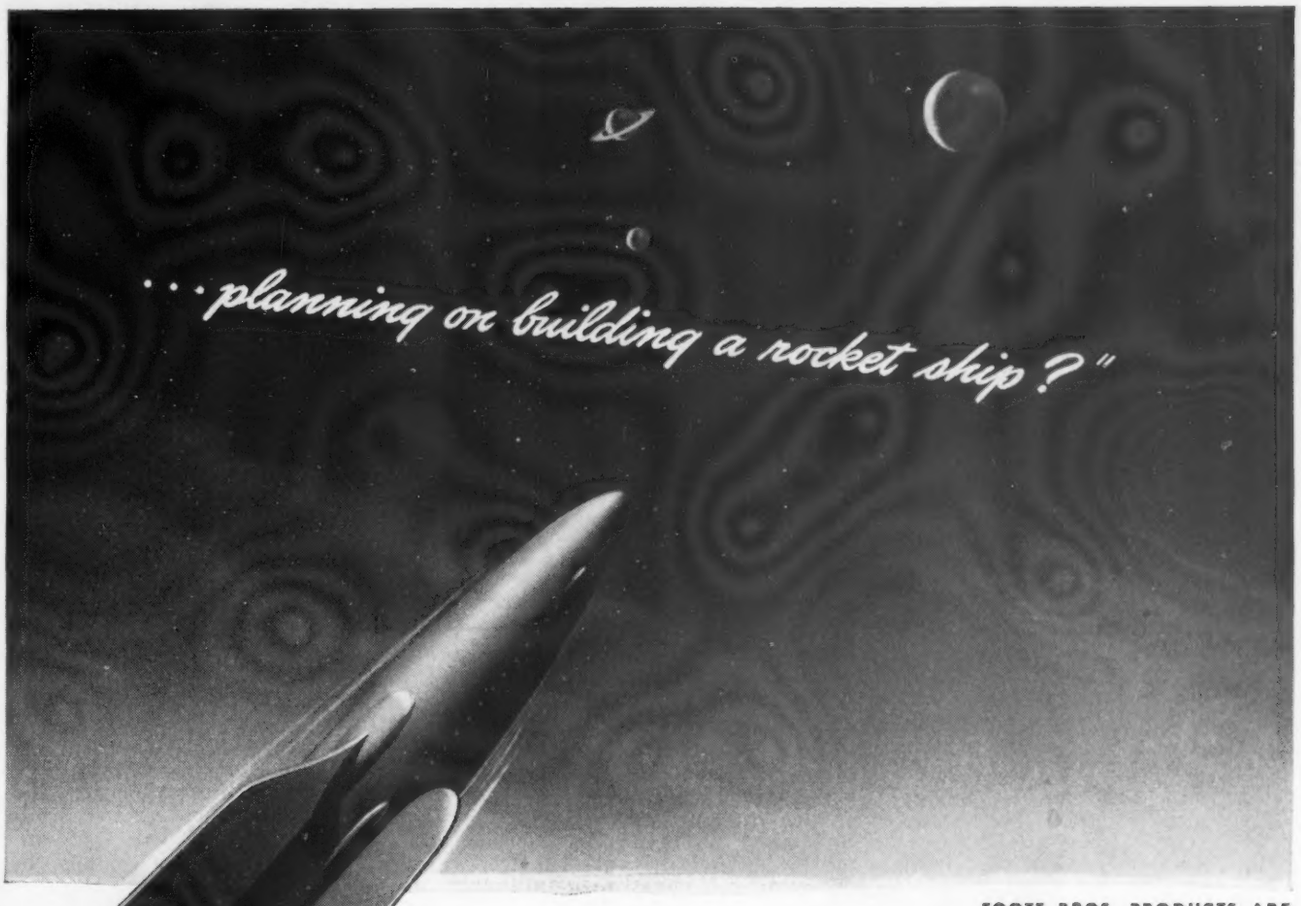


How long will it be before exploration of stellar spaces becomes practical? Ten years—fifty years—a hundred years? It is not wise to predict, particularly when we consider the advances that the past few years have brought.

But if you are developing a rocket ship, you will undoubtedly call on Foote Bros.—just as in the past manufacturers of other marvels of transportation have.

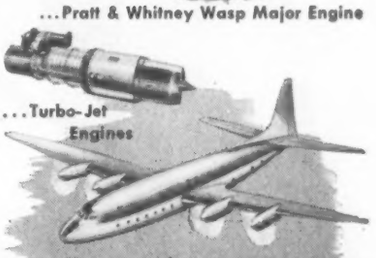
Today, Foote Bros. is producing precision gears of Aircraft Quality for many purposes where light weight, extremely high speeds, maximum efficiency, compactness and low noise level are important. Foote Bros. Power Units and Actuators provide absolute control from a remote point. These units assure accurate mounting so essential if the full benefit of "A-Q" Gears is to be realized.

Regardless of what your requirements in power transmission may be, Foote Bros.' two large plants are ready to serve you. The Precision Gear Division has complete facilities for producing "A-Q" Gears and Power Units in quantities. The Industrial Gear Division is equipped to turn out giant gears up to 20 feet in diameter or production runs of smaller gears. This division also manufactures speed reducers in sizes and ratios to meet almost every industrial need

FOOTE BROS. GEAR AND MACHINE CORPORATION
DEPARTMENT X, 4545 S. WESTERN BOULEVARD, CHICAGO 9, ILL.

FOOTE BROS. PRODUCTS ARE USED IN MANY OF THE LATEST AIRCRAFT DEVELOPMENTS

...Pratt & Whitney Wasp Major Engine



...Turbo-Jet Engines

...such modern transports as the Lockheed Constitution

...such revolutionary developments as the Northrup Flying Wing

A recent bulletin on Power Units gives complete engineering data on "packages of power." Sent on request. Also available, a bulletin on Aircraft Quality Gears. Mail coupon.

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Better Power Transmission Through Better Gears

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Please send me Bulletins on: ☐ Power Units ☐ Aircraft Quality Gears.

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Address.....
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Some things *can't* be concealed...

It takes a lot of effort to turn out a product that will pass a rigid inspection . . . but it gives one the nicest feeling. We, at Worth, know . . . because when a plate or head is finished it will stand the most exacting scrutiny.

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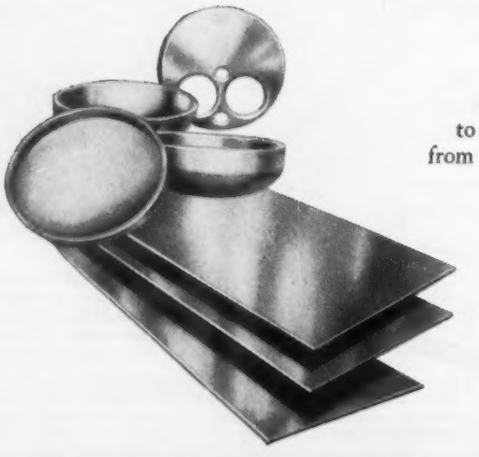

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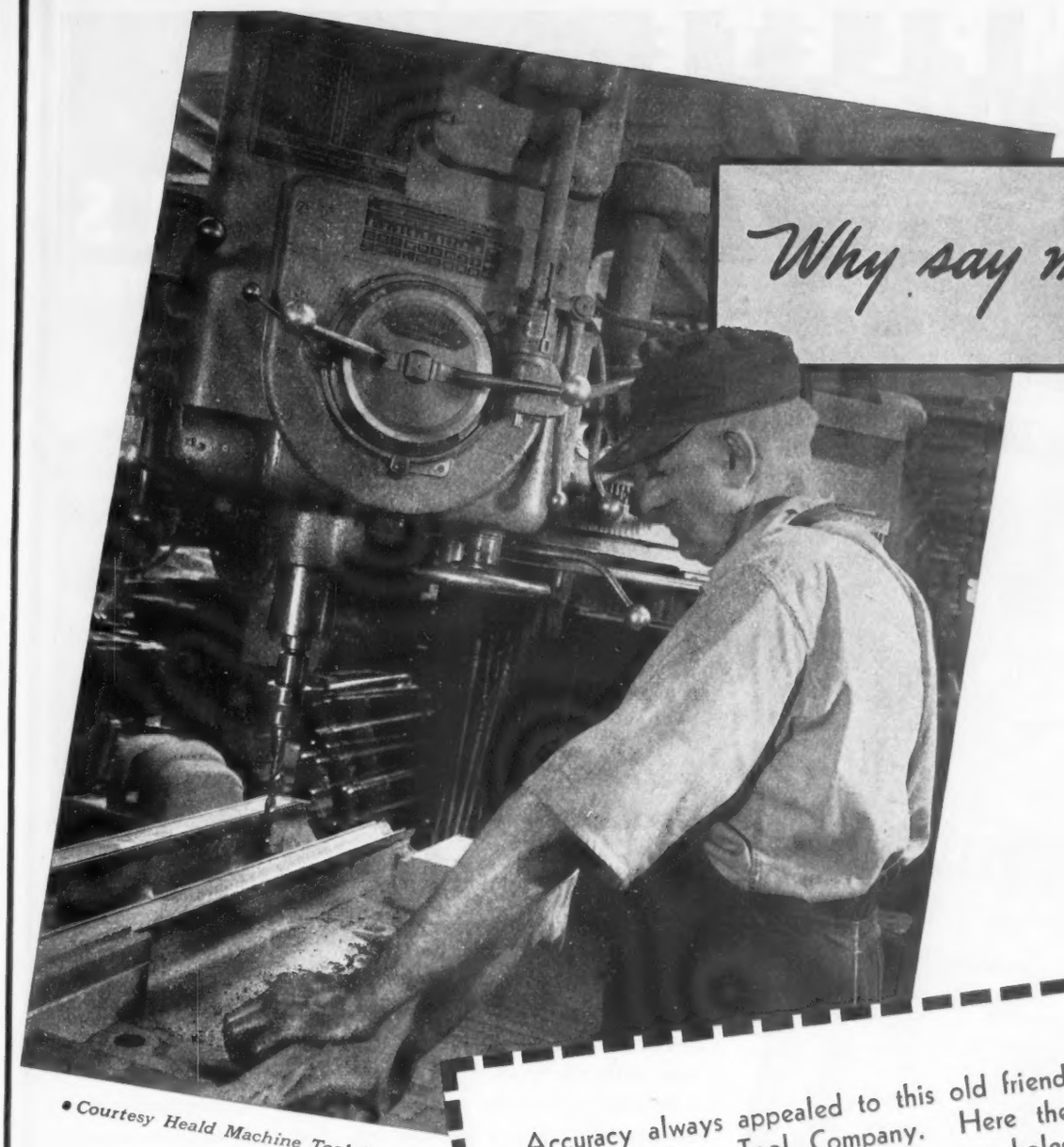

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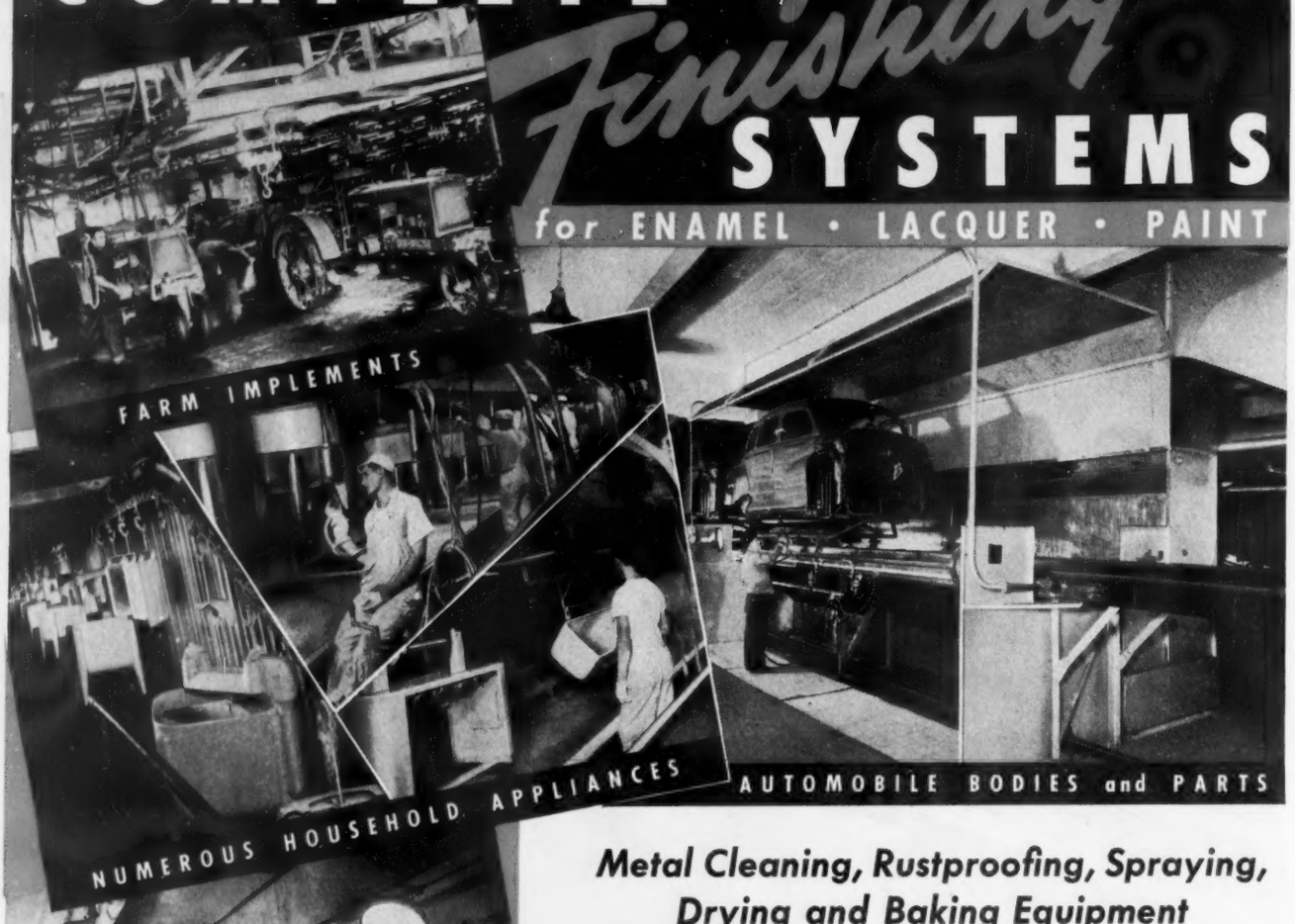

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STEEL

The Magazine of Metalworking and Metalproducing

VOL. 120, NO. 5 FEBRUARY 3, 1947

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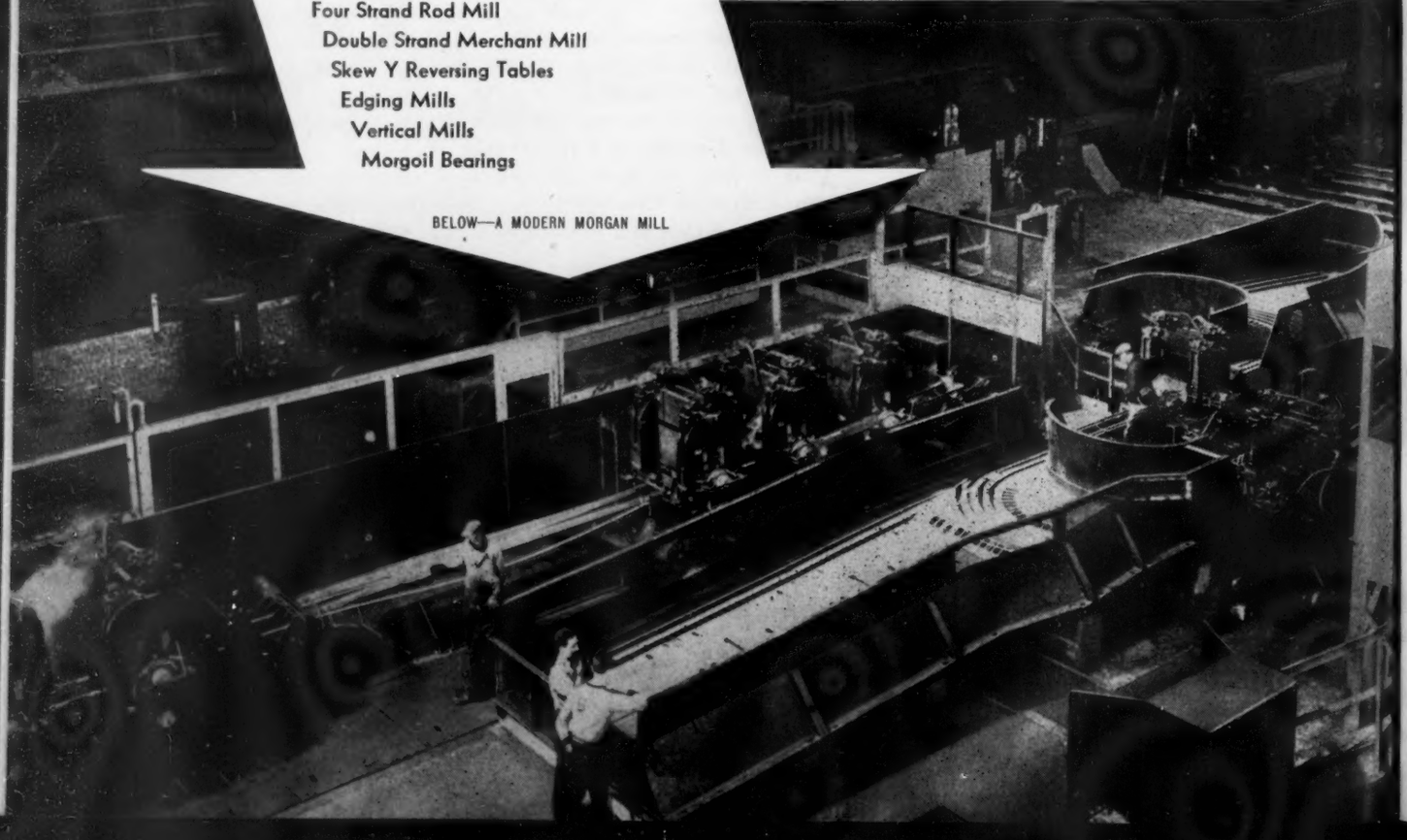
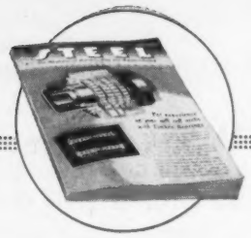




February 3, 1947

Headaches Ahead

This nation is heading straight into a thousand-and-one headaches in connection with postwar foreign trade. Neither the men in public office who decide policies and make the rules nor the management personnel of companies that are in a position to export or import goods have sufficient past experience or an adequate understanding of the ramifications of the big task ahead to enable them to proceed confidently in performing it. By necessity, they must muddle along haltingly by the trial and error method.

The over-all picture of postwar world trade is fairly clear. In the past the United States has been exporting about 10 per cent of the goods it produces and importing about 6 per cent of the goods it consumes. The recent war has made these traditional percentages meaningless and obsolete. From now on, we face a world condition wherein many other nations need more of our goods than they have ever received before and—even more important—they must have a greater opportunity than they have ever had previously to send us goods in sufficient volume to enable them to obtain dollars with which to buy the things they need urgently.

It is not likely that any informed person will challenge the soundness of this definition of the general problem. The headaches will arise from the attempts to work out policies that will conform to this world need of reciprocal trade and yet will not throw our own national economy too far out of balance.

A foretaste of what is ahead is discernible in the preliminary maneuvering in Washington. A few Republican leaders, including Senators Vandenburg and Taft, see the world situation quite clearly and wish to shape party tariff policy along new lines which will take this situation into account. Some other Republicans, fearful of possibilities under the Trade Agreements Act, are taking a position that might easily lead to a demand for a relatively high protective tariff. Responsible party leaders must realize the desirability of heading off at the outset any suspicion that the majority party is heading back toward prewar concepts of tariff policy.

What is needed more than anything else—by Congressmen and businessmen alike—is more trustworthy information regarding the foreign trade problem. Too many persons are tackling it with the outmoded implements of hunch and prejudice and too few are going at it with a sound knowledge of this nation's true and mandatory role in postwar world affairs.

• • •

LABOR SCENE TRANQUIL: While many observers are cautious about taking too much for granted in connection with the present status of industrial labor relations, it is certain that recent developments in the negotiations between representatives of United States Steel Corp. and the United Steelworkers have buoyed hopes that agreements eventually may be reached without strikes.

Extension of the wage contract between U. S. Steel subsidiaries and the union until Apr. 30, followed by similar extensions of contracts involving other steel companies and by a 30-day extension of the contract between Chrysler and the United Auto Workers, seems to insure at least several months of uninterrupted production at high levels in the metalworking industries. Other favorable developments are the return of free two-way bargaining as evidenced by the counter-proposals submitted by U. S. Steel subsidiaries in their negotiations with United Steelworkers, the agreement by these parties on the classifying of thousands of jobs in steel mills and the growing evidence that the portal-to-portal pay

(OVER)

suit strategy of the unions is back-firing.

Opposed to the encouraging import of these developments is the uncertainty still clouding the outcome of the John L. Lewis case in the Supreme Court. If the coal situation can be settled amicably, then the prospect for industrial peace will be brighter than it has been in several years. —pp. 68, 81

• • •

REPAIR WORK URGENT: Many operators of plants in the metalworking field face the problem of deciding whether they can wait for the delivery of machines or equipment that they have ordered or whether they must authorize extensive overhauling of existing old machines and equipment. In recent months, the postponement of delivery dates on ordered new equipment apparently has caused many companies to decide to go in for repairs on a grand scale.

Confirmation of this is found in the statistics on foundry equipment. A report of the American Foundry Equipment Manufacturers Association shows that the index of orders for repairs placed in December was 600.3, or six times the 1937-38-39 average of 100. This index has been running uniformly high throughout the last quarter of 1946.

As long as delivery dates are 12 months or more in the future, the volume of repair work on many types of equipment will continue abnormally high. —p. 72

• • •

WHAT IS IDEAL SITE?: National Carbon Co. will hold open house Feb. 5 and 6 to permit public inspection of its new $2 million plant at St. Albans, Vt., (population 8037). This news brings to mind the fact that National Carbon's other plants are at Bennington, Vt., (22,286); Fremont (14,710) and Fostoria (13,453), O.; Charlotte (100,899), Asheboro (6981) and Greenville (12,674), N. C.; Niagara Falls (78,029), N. Y.; Clarksburg (30,579), W. Va.; Columbia (10,579), Tenn.; and Cleveland.

This fairly widespread distribution of manufacturing facilities in cities and towns, which, with the exception of Cleveland and Charlotte, are of modest size as measured by population, raises the question as to what is the ideal location of a plant under the conditions prevailing in the postwar period.

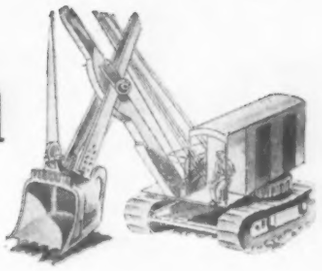
Of course there are too many factors involved to permit a general, unqualified answer. Nevertheless, the argument for decentralization and for dispersal of industry into small communities has been strengthened by the experience of war and by present-day social trends. —p. 84

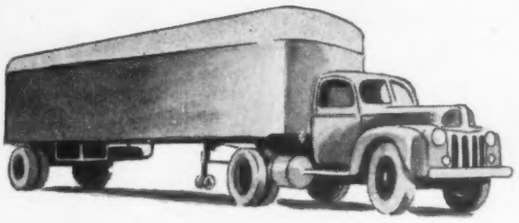
SIGNS OF THE TIMES: Accumulated orders for zinc-coated steel products, particularly galvanized roofing sheets, make it appear likely that when steel and zinc supplies permit, consumption of zinc for galvanizing will outstrip all previous records by a substantial margin. American Zinc Institute estimates that in 1946 zinc for galvanizing (p. 78) accounted for 325,000 tons of the total domestic consumption of 793,000 tons of slab zinc. Zinc consumed for diecasting reached an all-time peak in 1946. . . . Tests conducted intermittently since 1940 indicate that by applying and baking four successive layers of a thermo-setting plastic coating to the inside wall of oil well drill pipe (p. 124) many pipe failures caused by corrosion pitting during drilling operations can be prevented. . . . Since August, automobile and truck assemblies have been in the 350,000-400,000 range monthly and automobile builders now are hoping to step this up to 450,000 in April. If they succeed, production in the 12-month period from August, 1946, should be well over the 5,000,000 mark (p. 81), which would be a remarkable achievement in view of the obstacles encountered. . . . Industrial employment in the Los Angeles area in December totaled 193,000 (p. 87), which is only 3 per cent below the wartime high of 199,000. . . . New operating principles find application in two welding machines just introduced. In one, high air pressures up to 1000 psi control welding sequences in automatic high speed multispot resistance welding (p. 97) and in the other storage battery energy is employed to provide the excessive power needed for flash welding aluminum. . . . Believing that a serious copper shortage threatens the United States, Scovill Mfg. Co. is urging Congress to seek immediate repeal of the excise tax of 4 cents per pound (p. 79) which has been levied upon copper imports into this country since 1932. . . . Ford Motor Co. is displaying 2000 Ford and Mercury parts in Los Angeles and San Francisco (p. 86) and inviting Pacific Coast companies to bid on contracts for manufacturing these parts. . . . While some prices are breaking encouragingly, the Bureau of Labor Statistics index of commodity prices in primary markets is up to 140.8 (p. 168) from 140.0 in the previous week. Watch this index; a reversal in trend is imminent. . . . While bureaucracy fiddles, 20,000 army vehicles are rusting away near Ogden, Utah (p. 77), and the cost of neglect in other spots is mounting daily.

E. L. Shaner

EDITOR-IN-CHIEF

increase strength





reduce weight

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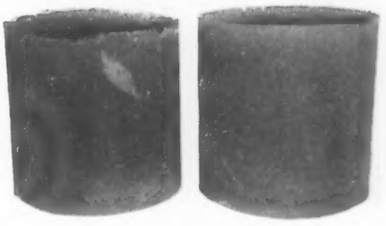

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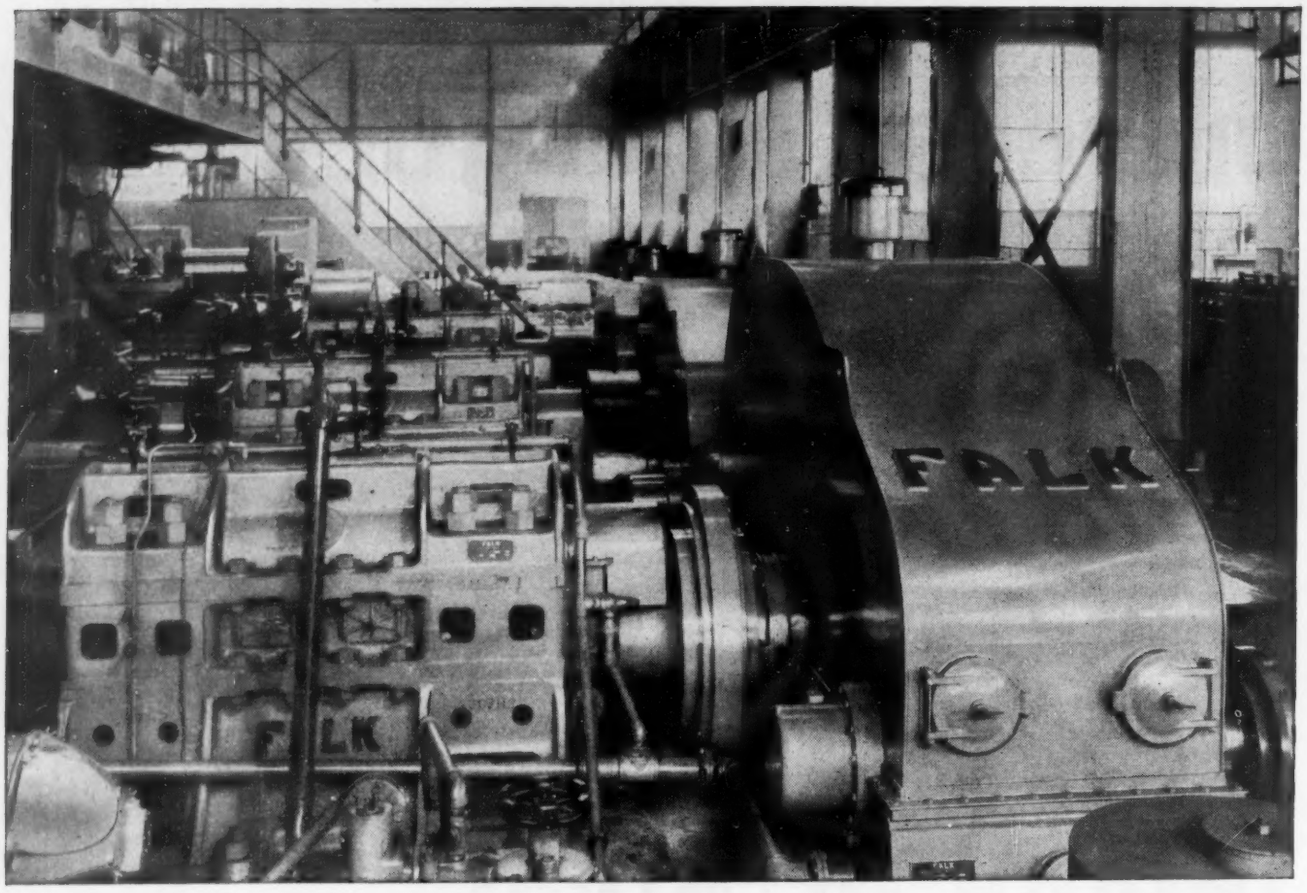

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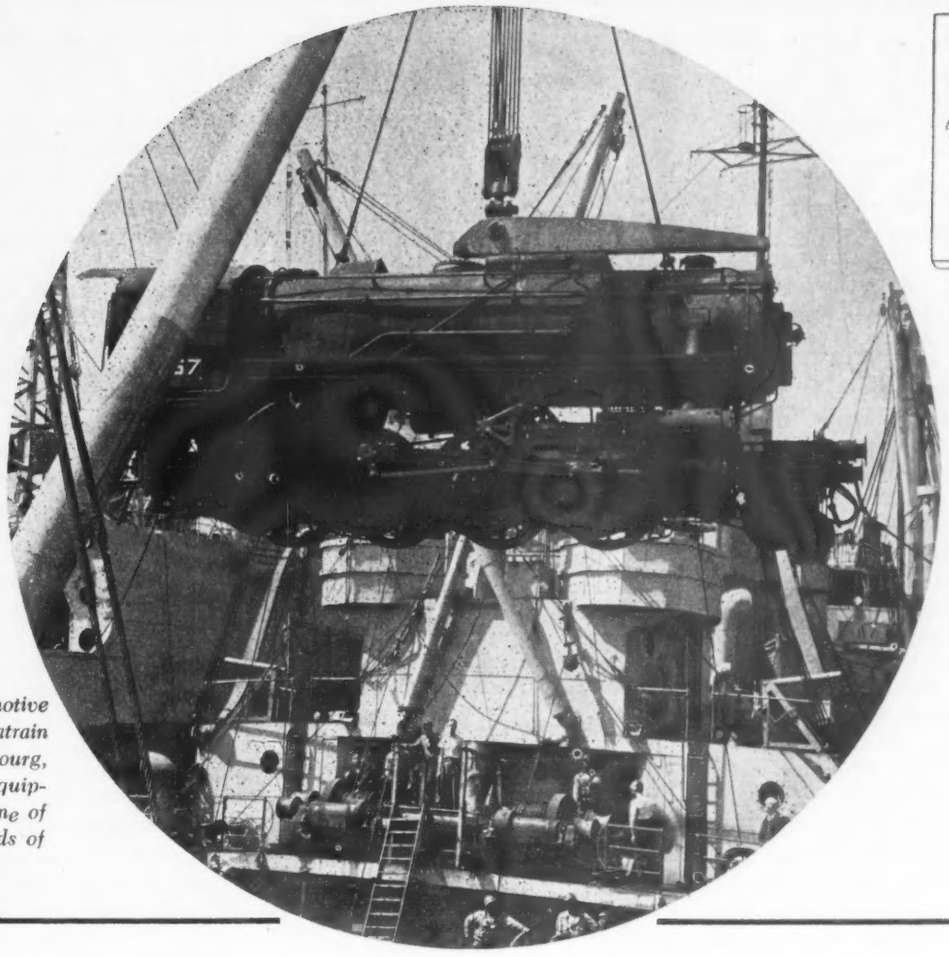


American locomotive swings from seatrain to dock at Cherbourg, France. Rail equipment continues one of the principal needs of Europe

Tariff Battle Brewing in Congress

Makings at hand for spirited debate as administration strives to forestall postponement of Geneva tariff conference set for April. Republican thinking on subject divided. Reciprocal trade agreements program may be resting on volcano

TARIFF battle is brewing which may explode one of these days with spectacular forensics in Congress. The makings are certainly at hand for one of the liveliest debates, if not one of the bitterest, on the subject in many a long year. The war is over, and the Republican party, traditionally tariff-minded and in control of Congress, can open up, if it wishes, the whole subject to extended debate.

The issue is particularly to the fore right now because of two events: 1. A movement by certain Republicans in Congress to block further implementation of the administration's trade agreements program; and, 2. Administraion plans to negotiate further tariff cuts with 18 countries this spring and press for formation of an international trade organization which would work with the United Nations for removal of trade barriers.

Strictly speaking, it is not a clear-cut battle between the parties that is brewing. As a matter of fact, it is unlikely the impending fight will resemble to any great degree the old slap-bang tariff battles between the Democrats and Republicans of the past. Actually, the issue crosses party lines with a wide split in thinking on the subject apparent in Republican ranks. Many influential Republicans are inclined to hold the tariff line about where it is, at least for the present, but a strong Republican bloc, unconvinced by the record under the Trade Agreements Act, is pressing for changes at least in policy.

In the confusion of thinking, Under Secretary of State William L. Clayton, who is carrying the ball for the administration in its program of extending the foreign trade agreements, finds himself in a tough spot. Currently the House Ways & Means Committee has before it two resolutions seeking postponement of further tariff negotiations pending review of the Reciprocal Trade Agreements program under which U. S. duties have been lowered about one-third over the past decade.

These resolutions, in effect, would force postponement of the International Tariff Conference scheduled to be held in Geneva, Switzerland, in April.

Such action, the administration feels, would be a body blow to international co-operation.

It is not impossible that the administration will give way to Republican viewpoint in some respects in effecting new trade agreements. At any rate, overtones at the hearings preparatory to negotiation of reciprocal trade agreements indicate a change in attitude on the part of administration officials. Up to the present, a one-way policy has

been pretty much the rule in tariff negotiations with other countries. We have been reducing our rates on imports in most cases without compensating benefits.

Numerous criticisms by Republicans have had their effect, and the members of the Committee on Reciprocity Information, handling the hearings for the State Department, give indications they realize the whole reciprocal trade agreements program is resting on a volcano. They have shown signs of being anxious to convince manufacturers and businessmen that in the coming negotiations they will put up a real fight to win advantages for Americans engaged in foreign trade.

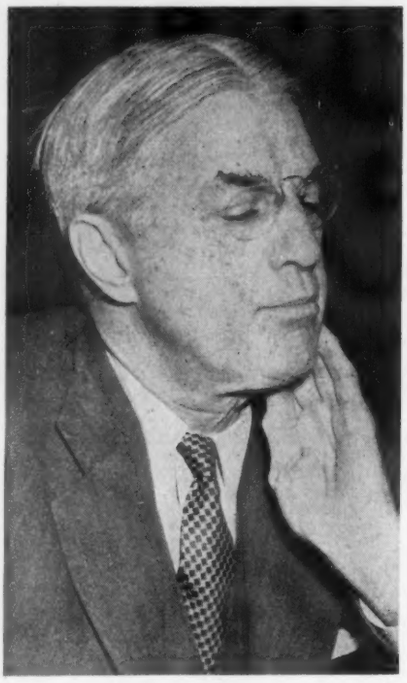
This disposition was reflected recently when William H. Johnstone, spokesman for the American Iron & Steel Institute, complained about the tariff walls American iron and steel products encounter abroad. The steelmaking countries like Great Britain, India, Australia, Canada and France, follow a uniform policy of excluding imports of those steel products which are made by their own mills.

By contrast, the United States market is virtually a free one; our iron and steel tariffs average a little less than 10 per cent based on current domestic iron and steel prices—and rates of 10 per cent or less do not serve as a barrier against imports.

Gives Three Recommendations

Taking the various angles into consideration, Mr. Johnstone suggested three approaches that would help the American iron and steel industry in its foreign trade operations in the future. First, an attempt should be made to get other steelmaking powers to reduce their tariffs on iron and steel products generally to somewhere near the level of the United States tariffs. Second, the so-called "imperial" preference that keeps American steel out of countries like Canada and India should be eliminated if possible. Third, special concessions should be sought on American steel products, like tin plate, which have good potential export markets now but are excluded by high tariff walls.

It was on this third recommendation that Mr. Johnstone got some encouragement from the committee. In considering the advisability of trying to compile accurate data on which to formulate the pattern of concessions to be sought, he explained, it was decided that such a study not only would be complicated, but also would be "quite useless." The committee did not agree with the latter conclusion. The presiding member, John W. Evans, representative of the Com-



WILLIAM L. CLAYTON

merce Department, asked Mr. Johnstone to proceed with this study.

"We are convinced that we are going to get concessions that will be worthwhile," declared Mr. Evans. "We want to see the steel industry get its share of them."

The committee view seemed to be that the tariff position of the iron and steel industry is quite liberal. The industry's request for minimum tariffs—or none at all—on basic raw materials like ores, tin, palm oil, nickel, ferrous scrap, etc., was received sympathetically by some committeemen who are impressed with the need for conservation of domestic reserves of items like manganese, chromite and tungsten ores.

Hearty denunciations of the existing trade treaty setup have come from various influential spokesmen at the hearings. Some statements have been received with no little surprise. For instance, Sen. Alben W. Barkley (Dem., Ky.) stated flatly at one session that he never has favored the idea of "free trade", asserting that no free trade proposals would win the support of the American people.

Telling criticisms were voiced by labor spokesmen. Matthew Woll, AFL vice president, denounced the setup in its entirety, holding that "reciprocal trade agreements were intended solely for an emergency period and not as permanent policy of the United States.

"Foreign workers have 2/3 to 1/3 of the productivity of American workers. They get 1/3 to 1/10 the wages paid in America. It should be evident that tariff rates, based on foreign valuations, of 7½ per cent on printed matter, or 10 per cent on shoes, or 30 or 40 per cent on glassware and pottery products do not equalize the difference in wages or labor costs," said Mr. Woll.

H. Wickliffe Rose, American Tariff League, told the committee that the whole reciprocal trade agreements program is so bad that we ought to throw it out the window and take a fresh start.

"Rather than give away the markets of this country in an atmosphere of political trading," he said, "we should revise our Tariff Act, review all rates of duty, and make changes in the light of conditions and needs existing at home."

One of the grave faults in current thinking is the placing of so much emphasis on reducing rates, said Mr. Rose. "The law authorizes increases or reductions to the extent of 50 per cent—but there never has been any raising of rates; all the changes have been in the downward direction. What we need is a flexible tariff, and a flexible administrative setup—so that rates can be changed in the light of business conditions prevailing at the particular time."

Recommendations of John Abbink, chairman of the National Foreign Trade Council, were in marked contrast. He said: "We need imports of raw materials and other products to supplement our own resources and to correct the present great excess of exports over imports. We need to conserve our resources of scarce metals, minerals and other materials by importing. All excessive and unnecessary tariff duties should be eliminated. Tariff rates should be reduced to the lowest possible level."

Supports State Department

He supported the State Department attitude which is that international trade is required on a scale vastly in excess of any past level, and that world economy and that of the United States require imports into the United States on a scale far beyond any previous level. We also must help other nations acquire foreign exchange, especially dollar exchange, with which to purchase in available markets the capital equipment and other products necessary for their economic reconstruction, development and prosperity.

The issue is not as clearly drawn as the diverse opinions expressed at the hearings would seem to indicate. The position of this country in world affairs puts the tariff question in entirely different light than that of a decade ago, and partisans of whatever political hue are conscious of the change which has taken place.

New Grade Classification for Flat-Rolled Carbon Steel Issued

Revision announced by American Rolling Mill Co., effective as of Jan. 29, expected to be followed by other leading producers . . . Specification, slitting, packaging extras also have been revised

AMERICAN Rolling Mill Co., Middletown, O., has established a new grade classification by sizes for flat hot-rolled carbon steel. This action, expected to be followed by other steel producers, became effective on shipments as of Jan. 29.

The sheet classification now extends to 0.2299 in. thick instead of 0.203 in. Plates now apply to widths over 6 in. in thickness 0.230 in. and heavier and to widths over 48 in. in thickness 0.180 in. and heavier. Purpose of above revisions is to get line of gage classification between sheets and plates as far away as possible from conventional order thickness for plates.

New grade classification by size of flat hot-rolled carbon steel follows:

Thickness range 0.2300 in. and thicker in widths under 6 in. inclusive is a bar; over 6 in. a plate.

Thickness range 0.2299 in. to 0.2031 in. is classified a bar up to 6 in. wide, inclusive; strip over 6 to 12 in.; sheet, over 12 to 48 in.; and plate, over 48 in.

Thickness range 0.2030 in. to 0.1800 in. is a strip under 12 in. wide, inclusive; sheet, over 12 in. to 48 in.; plate, over 48 in.

Thickness range 0.1799 in. to 0.0568 in. is strip under 12 in. wide, inclusive; over 12 in. a sheet.

Thickness range 0.0567 in. to 0.0449 in. is a strip under 6 in. wide, inclusive; sheet, over 6 in.

Thickness range 0.0448 in. to 0.0344 in. is strip 6 in. wide and under; hot-rolled annealed sheet, over 6 in. Over 3½-in. wide in thickness range 0.0343 in. to 0.0255 in. is hot-rolled annealed sheet; 5½-in. and less, a strip. All width ranges 0.0254 in. and thinner carry a hot-rolled annealed sheet classification.

The standard sizes for hot-rolled sheets have been eliminated from the extra card since item quantity extras and exact quantity extras now apply to all sizes. Previously the item quantity extras did not include standard sizes.

Specification extras for hot-rolled sheets have been revised, reflecting ASTM and U. S. Navy specifications in greater detail. An extra of 5 cents per 100 pounds for stress relieving test specimens is now charged. The extra for ordinary flange steel, ASTM-A-70 or equivalent, is 25 cents; similar extra also is charged for locomotive flange steel, ASTM-A-30 or equivalent.

Former slitting extra of 25 cents per 100 pounds now applies to cut lengths as well as coils, and has been revised as follows: 14 gage and heavier, 25 cents; 15 gage and lighter, 40 cents.

Packaging extras have been clarified and revised as follows:

An extra of 15 cents is charged for hand bundles, about 150 to 200 pounds clamped together with flat bundling bands. When a standard weight package is divided into loose, unwrapped lifts of less than 10,000 pounds each, with metal or wood separators, the following extras will apply in addition to regular packaging extras: Lift weights under 10,000 pounds to 5000 pounds; 1½ cents per 100 pounds; under 5000 to 2000 pounds, 2½ cents. No lift is to be lighter than 2000 pounds. These same extras will be made applicable to other sheet products, it is generally understood.

An extra of 5 cents for shrouding non-pickled sheets in 11 gage and heavier has been added to the extra card; also an extra of $1 per package for paper wrapping in excess of standard practice.

Carbon Cold-Rolled Strip Steel Extras Revised

Pittsburgh—Partial revision in carbon cold-rolled strip extras, is published in Sharon Steel Corp.'s new extra card, dated as of Dec. 10, 1946, replacing the previous card of Mar. 16, 1941. The new card shows sharp upward adjustments of as much as $1.15 per 100 pounds in size extras for heavier gages. The width ranges in the size extra schedule also have been revised. Previously there was a separate series of extras applicable on width range over 12 to 16-in. inclusive, and over 16 to 23⅛-in., in-

(*Please turn to page* 178)

Present, Past and Pending

■ WEIRTON STARTS 66-IN. HOT STRIP MILL

WEIRTON, W. VA.—Weirton Steel Co.'s new 66-in. hot strip mill, with a capacity of 135,000 tons a month, rolled its first steel Jan. 29. It replaces a 48-in. mill which ceased operations Jan. 13. During the interim, 800 men worked on round-the-clock shifts to install the new mill.

■ TENNESSEE COPPER LEASES ORDNANCE PLANT

BIRMINGHAM, ALA.—War Department has approved plan to lease the Oleum plant of Alabama Ordnance Works to the Tennessee Copper Co. Plant will be used to manufacture sulphuric acid.

■ AUTHORIZE APRIL, MAY TIN PLATE EXPORTS

WASHINGTON—Civilian Production Administration has authorized 65,000 tons of tin plate for April and May export licensing by the Office of International Trade. This does not assure that exports actually will reach this level as foreign shipments will depend on production.

■ NORTH AMERICAN ACQUIRES PLANT SPACE AT DOUGLAS

LONG BEACH, CALIF.—North American Aviation Inc., Los Angeles, has acquired 500,000 sq ft of plant space in the former Douglas Aircraft plant here for the construction of military aircraft. Employment will run between 2000 and 2500.

■ ELECTRICAL ENGINEERS PRESENT MEDALS

NEW YORK—Dr. L. W. Chubb, director of Westinghouse Research Laboratories, was presented the John Fritz Medal for notable scientific and industrial achievements during 1946 by the American Institute of Electrical Engineers. Dr. Vannevar Bush, chairman of the Joint Research & Development Board of the Army and Navy, received the Hoover Medal for outstanding public service. Dr. Lee de Forest, Chicago and Los Angeles, was presented the 1946 Edison Medal for pioneering achievements in radio.

■ LUKENS ANNOUNCES FULL LINE OF STAINLESS-CLAD STEELS

COATESVILLE, PA.—Manufacture of a complete line of stainless-clad steels is announced by Lukens Steel Co. Lukens began production of clad metals 17 years ago with nickel-clad steel and later developed inconel-clad and monel-clad steels.

Steel Wage Pact Extender Buoys Production Hope

Several months of industrial peace virtually assured; new output records for first quarter foreseen. Darkest cloud on labor horizon believed possibility of new coal strike in April

SEVERAL months of high and uninterrupted production in the metalworking industries has been virtually assured by the extension of the steel wage contract between United States Steel Corp. subsidiaries and the United Steelworkers until April 30. Most industrialists believe the first quarter will see new postwar records in production of finished steel and in manufactured hard goods.

Similar extensions were being made last week by other steel producers and the union. In the automotive field, Chrysler Corp. and the United Auto Workers announced their contract had been extended for 30 days. Contracts of General Motors and Ford still have several months to run.

The same forces that prompted the United Steelworkers to agree to the contract extension will work on other unions in the metalworking industries and it is likely that labor-management relations for at least the immediate future will be peaceful.

Several other developments in the labor-management field bolstered an optimistic outlook for industrial peace. These include:

1. The return of free two-way bargaining as evidenced by the counter-proposals submitted by U. S. Steel subsidiaries in their negotiations with the United Steelworkers. U. S. Steel informed the union it will expect a fair day's work for a fair day's pay, that it intends to retain the rights of management, that employees should be free to join or not to join a union, and the union must accept responsibility for fulfilling its part of the bargain.

2. Agreement between the union and U. S. Steel in classifying the thousands of jobs in steel mills and the establishment of specific job classification rates. This step is expected to reduce materially the grievances which in the past several years have been responsible for many minor work stoppages.

3. Increasing indications that union portal-to-portal pay suit strategy is backfiring and belief that the threatened liability of industry largely will be dissipated. Unionists privately admit that chances for collecting large sums for back walking time are dimming in the face of congressional and public opposition and by the avalanche of legislation and counter legal actions which are pending.

Industrial peace for the next few months appears assured by the extension of current wage contracts between steel producers and the union. This is expected to result in new postwar records in industrial production. Photo shows GE worker welding rotor ring for a large generator at General Electric Co.'s Schenectady, N. Y., plant

Clouding this generally favorable outlook is one dark prospect. That is that John L. Lewis may win his bout with the government in a Supreme Court decision later this month and that he may call out his miners again on April 1. A nation-wide coal strike in the spring, of course, could nullify all the progress made toward industrial peace.

Extension of the steel wage contracts was made on the industry's proposal, although the union quickly acceded. Both parties expressed their desire to "make a contribution to the national welfare" and pointed out that the extension will permit time for careful exploration of the proposals on each side and also will permit the clarification of industry's liability under the portal-to-portal pay suits. The concern expressed by the union over the uncertainty of industry regarding its liabilities under the portal pay suits, brought by the union, caused some cynical smiles.

Benjamin F. Fairless, U. S. Steel president, in announcing the extension, said:

"Our companies have been sued for over one-half billion dollars for alleged past portal-to-portal liability. The claim is made in these suits that our employees should now be paid retroactively as far back as 1938 for walking to work on company property, for changing clothes, and for time spent in washing. The amount for these activities is computed at overtime rates and then is doubled under the penalty provisions provided in the Wage and Hour Law. No one contends that the employees were not paid their full wages in accordance with the terms of the then existing labor contracts for all time actually worked as work was then understood and accepted by both parties.

"In the midst of this serious situation, had the union not agreed to the contract extension, we would have found ourselves facing an immediate demand to raise wages without knowing how long an individual employee works each day and how much he is entitled to receive at the end of the day—if the portal-to-portal pay theory is to be imposed. The union's demand for a substantial wage increase and its separate demand for portal-to-portal pay both involve higher wage costs. They must be considered together.

"This critical problem has been recognized by the Congress and bills are now under consideration. If legislation or further court decisions correct the present confused situation, both parties should be able to negotiate a labor contract with some understanding of the legal requirements and financial consequences.

"Until this matter is clarified the parties plan to continue collective bargaining conferences in an attempt to reach agreement on changes proposed for the new agreement, either by the companies or the union, which do not relate to cost aspects.

"No understanding has been reached that any contract terms ultimately agreed upon will be retroactive. This is a subject for future negotiation, along with all the other matters to be negotiated."

Higher Productivity, Open Shop Asked

THIRTEEN counter-proposals for incorporation in a labor agreement were made by U. S. Steel subsidiaries as negotiations continued under the extended contract.

A fair day's work for a fair day's pay is one of the principal conditions that will be required by the corporation.

A second major point is insistence that employees have the right to determine for themselves, free from intimidation, coercion or discrimination from any source, whether or not to become or to continue a member of the union.

The corporation further stipulates that both parties be bound by a no strike-no lockout pledge, by penalties for failure to live up to the agreement and by compulsory arbitration for grievances arising under the contract with functions of the arbiter limited to determinations involving interpretation, application or compliance with the contract provisions.

Some of the companies' proposals are expressed or implied by the language of the present agreement, but the companies believe the new contract should contain clearer statements and more logical arrangements of the conditions so as to minimize the possibilities of erroneous interpretations and to facilitate administration of the contract in the plants as well as in arbitration.

One such section defines the authority of management, as follows:

The authority and responsibility of the company to manage the business and to direct the working forces consistent with the provisions of the agreement shall not be abridged, and management shall not be obstructed by acts of the union, its representatives or employees of the company represented by the union. In making the agreement, it shall be clearly understood that:

(a) The provisions of the agreement shall in no way assign or be interpreted to assign to the union, its representatives, or any of the employees represented by the union any of the authority or responsibility which is vested in management.

(b) The company, consistent with the provisions of the agreement, shall determine and decide such matters as how, when and where the company will:

(1) Establish new jobs or abolish or change existing jobs;

(2) Increase or decrease the number of jobs in the various departments;

(3) Apply wage incentives;

(4) Change materials, products, processes, equipment or operations;

(5) Schedule employees, operations, and work to be performed;

(6) Promote, demote, transfer, terminate or hire employees; and

(7) Maintain discipline of employees.

Accord Reached on Job Classification

AGREEMENT on a job classification system and standard hourly wage scales, the result of two years of negotiations between U. S. Steel and the union, was announced soon after the present wage contract was extended. This agreement is expected to eliminate many grievances over alleged wage inequities.

Under the agreement, more than 25,000 widely varied steel mill jobs are grouped into 30 general labor classifications, with a proper relationship established between respective wage rates for the various classifications.

Thus, sweepers and janitors are placed in job class 0-1, which carries a wage rate of 96½ cents an hour under the present agreement. General labor is in job class 2, carrying a rate of $1 an hour. Heavy and dirty labor and oilers are in job class 4, receiving $1.07 an hour. Shop helpers fall in job class 5, carrying $1.10½ an hour. Rollers in finishing mills are in job classes 19, 20 and 21, receiving from $1.59½ to $1.66½ an hour. Highest paid workers are the blooming mill rollers and blowers in bessemer in job classes 26 to 30 and receiving up to $1.98 an hour under the present contract.

Joint committees of management and labor are at work in 84 other steel companies attempting to set up similar schedules.

The agreement provides for retroactive payments, to Jan. 4, 1944, of 70 per cent of the total hourly adjustments which will be applicable to them in the future. For the steel producing subsidiaries of U. S. Steel, this will mean retroactive payments in excess of $30 million. The union estimates the revision will add $17 million annually to corporation payrolls.

For the entire industry, the union estimates retroactive payments of $100 million will be required and that the industry wage bill will be raised by $50 million annually in the future. Retroactive payments will be made in lump sums.

Union's Portal Pay Strategy Backfires

THE spectre of hundreds of companies being reduced to insolvency through portal-to-portal pay suits demanding close to $5 billion is evaporating in the face of aroused congressional and public opinion.

Union leaders are beginning to wonder about the wisdom of their strategy in filing these suits and many privately concede they have little hope of collecting large sums through them.

Few companies have indicated any desire to compromise the unions' demands. There are two reasons for their reluctance. One is that the present law does not recognize any compromise settlements. The second is that industry is encouraged by the apparent determination of Congress to outlaw portal pay suits.

A plethora of measures to curb the back portal pay suits already have been introduced in Congress and early action on this issue appears assured, either through outlawing such suits or placing a 100 per cent tax on portal-to-portal windfalls to workers.

Attorney General Tom Clark has filed a brief with Judge Frank A. Picard of the United States District Court of the Eastern District who handed down the original decision in the Mt. Clemens Pottery Co. case, asking for dismissal of the workers' claims unless new evidence can be introduced to add weight to the pottery workers' claims.

Little Change Reported in Bookings of Electric Trucks

Domestic bookings for electric industrial trucks and tractors in November showed little change from October. Net value of chassis only booked in November totaled $1,297,006, compared with $1,219,469 during October, the Electric Industrial Truck Association, Chicago, reported.

United States Steel Corp.'s 1946 Net Profit Largest Since 1941

Strike costs, estimated at $29,200,000, charged to special reserve instead of income. Corporation making slight headway in reducing backlog, now five months against six months at end of third quarter. Freight rate increases impose heavy burden

UNITED STATES Steel Corp. reported for 1946 its largest net income since 1941. However, it was able to do so only by charging the expense of strikes and certain war costs to a special fund set up in earlier years.

The 1946 net income is reported as $88,683,530, compared with $116,171,075 in 1941. Had the corporation not charged against a special fund $29,200,000 for strike costs and certain war costs the 1946 net income would have been shown only as $59,483,530, just slightly above the 1945 net income of $58,015,056.

Until 1946, net income had been declining each year since 1941. Fourth quarter income in 1946 was down slightly, being $31,215,636, compared with $33,329,353 in the third quarter.

Net current assets of the corporation and its subsidiaries at Dec. 31, 1946, after deducting current dividend declarations, were $629,159,702, compared with $600,760,252 at Dec. 31, 1945.

Of the reserve, provided during the war years, for estimated additional costs arising out of the war, $912,906 was used in the fourth quarter of 1946 to cover increased costs of replacing inventories depleted during the war. Balance in this reserve at Dec. 31, 1946, was $27,961,425.

Improvements Made to Fixed Assets

During 1946, total additions to and betterments of fixed assets amounted to approximately $201 million. This amount includes $110 million which represents the price of facilities purchased during the year from the government. Balance of the funds segregated for property additions, after deducting the cost of these facilities purchased from the government, is $140 million. On Dec. 31, 1946, additional expenditures planned for property additions and replacements amounted to around $278 million.

Amount of long term debt outstanding at Dec. 31, 1946, was $87,521,601, compared with $92,716,293 at Dec. 31, 1945.

Average number of employees was down to 275,805 in the fourth quarter, compared with 276,793 in the third quarter. However, fourth quarter payroll was up to $195,602,340, compared with $194,888,028 in the third quarter. Average number of employees for the year was down to 266,727 in 1946, compared with 279,274 in 1945. Total payroll for 1946 was $694,114,463. In 1945 it was $786,721,918.

The corporation reported steel products shipments of 4,902,742 net tons in the fourth quarter of 1946, compared with 4,457,557 in the third quarter that year, and 4,096,568 in the fourth quarter of 1945. Subject to yearend adjustments, 1946 shipments totaled 15,247,752 net tons, a decrease of 3,162,512 tons from 1945. However, shipments in only five former peacetime years exceeded those in 1946. Peacetime record was 16,812,650 net tons shipped in 1929.

Largely as a result of strikes, production of steel ingots and castings in 1946 averaged only 72.9 per cent of rated capacity. Steel production in the fourth quarter of 1946 averaged 87.4 per cent of rated capacity. The corporation estimates it lost 6.3 million tons of steel production because of the steel and coal strikes in 1946.

The corporation is making some headway in reducing its steel backlog, Chairman Irving S. Olds indicated. Unfilled orders now are the equivalent of five months' production at the present rate of operation, as compared with six months three months ago.

However, he said, steel demand is still pressing and it should take at least six months of consistently high operations to relieve consuming pressure appreciably. Steel sales offices of the corporation continue to receive many requests for tonnage which they are unable to supply, despite high operations.

Mr. Olds said he saw no real evidence of duplicated orders, although he remarked that under present conditions there must be some. The corporation's steel exports last year were between 5 and 6 per cent of total finished steel shipments and at present are averaging around 6 per cent, he said.

Commenting upon the continued shortage of freight cars and pressure for steel to build new ones, he said he thought the government had set its sights too high in its present plans for expanding freight car construction. There simply is not sufficient steel in prospect, he believes.

The steel corporation has arrived at a capacity rating for its Geneva, Utah, plant of 784,000 tons, bringing total ingot capacity rating for its subsidiaries up to 29,547,200 tons, with due allowance for adjustments at various other plants of about 50,000 tons. The figure represents what corporation officials believe to be a fair peacetime rating, one that is approximately 60 per cent of the Geneva plant's potential wartime capacity.

Work on finishing capacity there is proceeding slowly, Mr. Olds said, due to continued difficulty in obtaining necessary equipment, especially electrical equipment. In fact, that applied to the corporation's expansion program in general. There would be no production of hot rolled coils at Geneva this year, he was sure. Meanwhile, principal production is in plates and shapes, production on the latter getting under way last November.

Mr. Olds reported 24 "portal-to-portal" suits have been filed against the corporation to date, with 18 specific amounts totaling $618 million, not including legal fees which may be involved. "The demands," he said, "are so fantastic, so beyond any ability to pay, that there must be some remedial relief." Such relief may come through legislative or Supreme Court action, he indicated; nevertheless, the demands must be taken most seriously.

Wage Demands Remain Uncertain

He said the United Steelworkers have as yet submitted no specific wage demands, other than to say the increases they want will be "substantial." The corporation chairman said wage increases in 1946 cost the corporation $26 million. Asked whether he saw any evidences of improved efficiency among workers, Mr. Olds said it was difficult so far to say, as there isn't a very definite yardstick to go by.

In reply to a question, he said he had nothing on the current break-even point for his company or the industry.

Recent freight rate increases will impose a direct burden on the steel corporation of $20 million a year, he estimated. They will also impose a substantial burden, which cannot at present be estimated, through materials and commodities purchased. Increases in freight rates emphasize, he said, the importance of having plants in consuming districts.

Recent reports that steel corporation interests were buying land near Baltimore for tidewater operations were without foundation, Mr. Olds said.

Study and development of a sound

incentive program to rectify any existing wage inequalities is being started by the steel corporation, now that the task of job reclassification has been completed.

Jones & Laughlin Reports Increase in Net Income

Increase in net income for the last quarter of 1946 and also for the entire year was reported last week by Jones & Laughlin Steel Corp., Pittsburgh.

For the last quarter net income was $4,744,824, compared with $2,367,774 in the corresponding period of 1945 and $2,952,716 in the third quarter of 1946. Net income for the year totaled $10,854,084, compared with $8,082,082 in 1945. Of the 1946 net profit, $4 million came from the contingency reserve to help offset extraordinary expenses.

Keystone Steel Sets New Quarterly Profit Record

Net profit of Keystone Steel & Wire Co., Peoria, Ill., in the last three months of 1946 set a new high record for a quarterly period. At $1,175,392, it was more than double the $537,329 net profit of the last quarter of 1945.

In the last six months of 1946 the company's net profit aggregated $2,091,535, compared with $822,468 in the last half of 1945.

The profit showing of the last quarter of 1946 is to a great extent the result, said the company, of the increased tonnage of finished products the company is now selling compared with previous years when sales included a large tonnage of semifinished products. Both sales and earnings, the company said, are reflecting the benefits of expansion during the past several years of capacities for producing the relatively more profitable finished wire products. Except for a comparatively small tonnage of semifinished steel supplied to subsidiaries, Keystone is now converting practically its entire basic steel production into finished products. Before the war, approximately one-fourth of Keystone's steel output was sold in semifinished form.

Increase in Net Income Shown by Inland Steel Co.

Inland Steel Co., Chicago, has reported its net income for 1946 was $15,556,897 before deducting $1,012,776 allocated to contingency reserve for possible future inventory price decline and other purposes. Net income in 1945 was $9,861,210.

The 1946 net income of $15,556,897 is after deducting strike costs and retroactive pay of $3,041,850.

Wheeling Steel Reports On Net Earnings for 1946

Preliminary report of Wheeling Steel Corp., Wheeling, W. Va., shows a net profit for 1946 of $5,372,910 after all charges including federal taxes but before deducting a net loss of $2,012,522 charged directly against surplus as a result of the sale of the corporation's Portsmouth plant last July.

In 1945, net profit was $3,950,252.

Lukens Steel Co. Reports Net Profit of $360,050

Net profit of $360,050 has been reported by Lukens Steel Co. and subsidiaries, Coatesville, Pa., for the first quarter of their 1947 fiscal year which ended Dec. 28, 1946. This is in contrast with a net loss of $156,929 in the corresponding period of the 1946 fiscal year.

Bethlehem 1946 Profits Equal to $11.79 a Share

Bethlehem Steel Corp.'s net profit for 1946 was $41,731,931, after provision for $15,500,000 for income taxes. This compares with a net of $34,947,116, after provision of $12,200,000 for taxes, in 1945.

For the fourth quarter, the corporation's income was $11,937,281, after all charges and allowing $4,790,000 for taxes. This compares with $10,543,005 in the September quarter, after allowance of $7,160,000 for taxes, and with $11,447,858, after tax allowance of $4,630,000 in the fourth quarter of 1945.

Earnings for all of 1946 were equal to $11.79 a common share. Fourth quarter earnings were $3.45 a common share.

JET BOMBER: First official view of the XB-46, experimental four-jet bomber being built for the Army Air Forces by Consolidated Vultee Aircraft Corp. It has been under secret construction at Convair's San Diego, Calif., plant for the past two years. The medium bomber is powered by four General Electric turbojet engines located in two low-slung nacelles and is now undergoing preliminary tests

Steel Export Priority Tonnage To Be Increased

Steel producers are required to accept any priority orders issued under the current steel export program of the Civilian Production Administration as a result of that agency's action last week eliminating the former general 2 per cent limit of production over which producers formerly were permitted to reject rated export orders.

Total rated export orders in 1946 were less than 2 per cent of estimated overall output of 47 million tons of steel products, CPA officials said. However, a limit has now been removed because 1947 foreseeable exports will require more than 2 per cent of some products, but less of others.

The overall steel program will be held closely to the 1946 ratio of rated export orders to total production, the agency said. The export program on which priorities assistance is to be given in first quarter includes tonnages for shipment in April and May, as the complete program is not yet fully determined.

Shortage of New Equipment Spurs Rate of Repairs

With new equipment difficult to obtain, foundries find it necessary to continue heavy volume of repairing

BECAUSE backlogs of orders for new foundry equipment are still heavy, foundries continue to find it necessary to do a considerable volume of repairing of existing equipment.

An indication of this is a report by the Foundry Equipment Manufacturers Association, Cleveland, that the index of orders placed in December for repairs was 600.3 per cent, six times the 1937-38-39 average of 100. The repair index was higher in each of the last three months of 1946 than in any of the other months that year. Low month of the year was February, with a 342.6 per cent index.

Contributing to difficulties in making deliveries of new equipment are materials and components shortages, particularly ball bearings, fractional horsepower motors, and castings. Delivery dates are said to average 12 months in the future, with some equipment available within six months and other types not deliverable for two years.

Prices on new equipment for foundries are reported holding near the previous government price ceilings.

Current ordering of new equipment probably would be at a higher level if earlier deliveries could be made. In December, the index of new equipment orders was 379 per cent of the 1937-38-39 average of 100, compared with 421 in November and last year's monthly high of 779.8 per cent in April. Increased labor costs and difficulty in obtaining satisfactory foundry labor are expected to contribute to increased mechanization of foundries with a resultant sustained demand for new equipment.

GENERATE LOTS OF POWER: These are the principal parts of the "resnatron," an electronic tube which generates immense quantities of high frequency current. It was used during the war to jam enemy radar and will be adapted to peacetime television and frequency modulated radio. Parts shown were taken from the tube which is claimed to have broken the world's power record by delivering 140 kilowatts of continuous power. Shown examining them are three scientists of the University of California who aided in developing the tube. Left to right: Dr. David Sloan, Dr. Winfield Salisbury, and Dr. L. C. Marshall. NEA photo

Supply of WAA Surplus Machine Tools Increased

Supply of government surplus equipment for sale to the public has been increased by greatly reducing the list of short supply machine tools, available only to priority holders, the Cleveland regional office of the War Assets Administration announced.

By carefully analyzing machine tool sales, WAA officials learned that many machines placed on that list were not in demand by priority holders and were, therefore, removed and placed on the open market. This allows licensed dealers to have an increased selection of tools to sell.

To help industry understand the WAA program for obtaining new machine tools, six WAA representatives in the Cleveland region are making visits to plants.

WAA Restrictions Lifted From Surplus for Export

Lifting of restrictions on sale of surplus property for export, except those controls governed by other agencies, has been announced by War Assets Administration.

In a statement of policy, WAA said that prospective purchasers for export shall receive notice of and can participate in all public offerings of surpluses on an equal basis with other purchasers for domestic use having the same status with respect to priorities. Thus, WAA in making sales shall accord to non-priority exporters the same treatment as to price, quantities apportioned and other conditions of sale as are accorded to any non-priority purchaser, including wholesaler or dealer.

WAA explained that shortages in many commodities are disappearing as production increases and that to the extent that surpluses can be sold abroad, the domestic market is relieved and left open to absorb new production. The agency also pointed out that the sale of surplus commodities in foreign countries will aid in the development of future export markets for the United States.

Canadian Iron and Steel Makers Still Look for Ceiling Price Increase

Hope for action in ferrous group similar to that taken with boost granted in nonferrous metal prices, but chances thought less promising as government officials in Ottawa remain silent on the matter

CANADIAN iron and steel producers continue to look hopefully to Wartime Prices and Trade Board for a boost in ceiling prices, and it is believed in some quarters that the lift in nonferrous metal prices may be followed by somewhat similar action in the ferrous group. However, no pronouncements, one way or another, have been coming from Ottawa officials in this matter, and so it is now generally conceded that if an upward revision is made it will come as something of a surprise.

In the meantime any new business being booked by steelmakers is taken with prices to be made known at time of shipment. New order placing in the Canadian markets is restricted, due to the fact that most producers now are fully booked and have little or no surplus capacity remaining to the end of June. While production is being maintained virtually at capacity of raw steel supply and shipments of various steel materials have speeded up in the past month or six weeks, there is still a wide gulf between supply and demand, and it is not expected that there will be much equalization before last quarter or possibly early in 1948.

Capacities Booked Well Ahead

Sheetmakers are out of the market, and they will not accept new orders before third quarter for either black or galvanized sheets. Business is developing on a broader scale for steel plate, and orders from shipbuilders and locomotive manufacturers, as well as consumers in other trades, will keep Canadian plate mills at capacity operations for most of the year. Practically all carbon bar capacity is filled to the end of June, but there is still additional capacity available this quarter on alloy bars.

Fabricators are still taking orders on heavy structural shapes even though the backlogs alone will take maximum output until the end of September. It is estimated that almost 50,000 tons of structural steel are pending in connection with construction programs announced within the past three months.

The scrap supply situation is steadily worsening. There are indications that some accumulations are being held off the market in the hope of higher prices. However, even if all scrap in Canada were thown on the market, it is believed the shortage would continue. Some large Ontario scrap consumers have been bringing it from England and the European continent, pointing out that they are unable to obtain much scrap from domestic sources and the price differential shuts out United States supplies.

Nonferrous Metal Prices Rise

Donald Gordon, director of Wartime Prices and Trade Board, of Canada, has announced an increase in domestic nonferrous metal prices. The ceiling on copper has been raised from 11.5 cents to 16.625 cents per pound; lead from 5 cents to 10.625 cents and zinc from 5.75 to 10.25 cents per pound.

Exports Hit Peacetime High

Canada's export trade for November totaled $232,219,000 compared with $204,150,000 for October and $238,637,000 for November, 1945. For the 11 months ended with November exports had a total value of $2,100,313,000 which was the highest peacetime figure on record, but was approximately 30 per cent below the value for a similar period in 1945 when war and relief shipments were heavy. They were well above the annual average of $884,536,000 for the five prewar years, 1935-39. Exports of iron and steel products in November were valued at $18,921,000 against $10,658,000 in October and $17,181,000 in November, 1945. In November nonferrous metal products as a group were exported to the value of $27,468,000, a gain of about $1,300,000 over November, 1945.

French Industrial Recovery Program Beset by Wage Disputes and Inflation

PARIS

STRENGTHENED by formal approval of the National Assembly and bolstered by the anti-inflation drive to reduce prices 5 per cent, the French industrial recovery plan has weathered its first month although harassed by several issues, particularly the wage question.

Insistent demands were made by state and utility corporation employees for higher salaries, so that the government was forced to yield to the claims despite its anti-inflation measures. Still unsatisfied, the workers threaten to reopen the issue once the new ministry of Premier Paul Ramadier is better organized. Moreover, another serious wage demand remains with the continued agitation of all low-salaried workers, public as well as private, for a minimum pay of approximately $60 per month with an additional 20 per cent for a 48-hour week which would bring it up to $70. These demands are backed by the General Confederation of Labor which is under a strong Communistic influence.

Industrialists, on the other hand, point to banknote printing activities of the government as among the chief contributing factors to spiralling prices, which in turn precipitate the wage demands. They call for a remedy of this ill and indicate that the establishment of a minimum wage throughout France would have as one of its effects still another jump in prices with a particularly heavy burden upon the government which would find itself faced with an even heavier civil servant salary list in spite of the fact that it is already struggling with a large budget deficit.

Integration of six basic industries is the immediate objective of the four-year industrial program, and a start has been made to this end among the industries concerned, which include iron and steel, coal, electricity, cement, agricultural machinery and transportation. Steel production remains about the same, with an output of about 85 per cent of that produced in 1938. In December 448,000 metric tons were recorded, which is 86 per cent of the figure for December, 1938. By the end of the year it is expected that France will be producing 125 per cent of her 1929 output, this having been the record year.

Much benefit for French industrial recovery is expected to arise from talks between Leon Blum, immediate past socialist premier, and officials of the British Labor government. France hopes to reach an economic agreement with Britain whereby an effort will be made to relate each country's production schedules, export and import programs, investment arrangements and economic policies pursued in the British and French colonial empires.

Windows of Washington

By E. C. KREUTZBERG — *Washington Editor, STEEL*

Justice Department unable to grant blanket immunity from prosecution under antitrust laws to industry advisory committees. Army and Navy Munitions Board plans to organize 17 advisory groups on materials and 12 on end products

IN PREPARING to organize a number of industry advisory committees, Army and Navy Munitions Board attorneys are being forced to proceed without any great comfort from the Justice Department. In brief, the Justice Department cannot grant any blanket immunity, and companies participating in the activities of these committees must avoid violating the antitrust laws.

In essence, the Justice Department position is: "It is not illegal to hold meetings—you can ask anybody for advice and information. But do not discuss matters that might result in price agreements, curtailment of production or in unlawful combinations in restraint of trade."

The Justice Department during the war, it is recalled, refused to go along when the War Production Board asked for virtual antitrust law immunity for the members of its 500 industry advisory committees. All that Justice would agree to at that time was to suspend enforcement until after the war. Now that the war is over, the Justice Department is reviving, to the extent permitted by its present limited legal staff, cases that were pending at the time of the wartime suspension. In particular, Justice points out that it is trying to carry out President Truman's recent mandate that the antitrust laws be prosecuted vigorously.

The key to keeping co-operating industrialists out of trouble, Army and Navy Munitions Board attorneys believe, is to prepare carefully for the meetings with industry advisory committees and confine the discussions to subjects that will not invite violations of the antitrust laws. The immediate problem is to prepare the agenda for meetings with committees to be called into existence under the stockpiling act of 1946. Under this law the board is required to discuss with the interested industrialists the problems incident to stockpiling of critical and strategic materials. Matters having to do with the quality and availability of materials from different sources, and with policies involved in purchasing, handling and storing these materials, can be discussed safely for the most part. Whether the interested industrialists will be asked to discuss prices the government is warranted in paying for the various materials still is a moot point.

Plans of the board are to set up as few industry advisory committees as possible. At the start there probably will be 17 committees concerned with materials, and an additional 12 concerned with products made from these materials. The membership of these committees now is being determined on the basis of nominations from the industries involved. Later on, as the board tackles other problems, additional committees will be organized. Among problems slated for discussion with industry committees are those involved in relocating key industrial plants, by dispersal and by utilizing underground locations, to minimize production losses from possible attacks by atomic bombs and by modern guided missiles.

CONTINUE WAR PROBE: Republicans won a major fight of the new Congress when the Senate voted 49 to 43 to continue the Special War Investigating Committee for another year. Leaders in the battle to continue the investigation, left to right: Sen. Homer Ferguson of Michigan; Sen. Owen J. Brewster of Maine; Sen. Joseph Ball of Minnesota; and Sen. William Knowland of California. NEA photo

Atomic Energy Papers Available

The first 270 atomic energy papers to be declassified by the Atomic Energy Commission or by its predecessor the Manhattan Engineer District, now are available to the public. They are described in a price list just issued by the Office of Technical Services, Commerce Department, Washington 25, D. C. In general, they are on a high scientific level and report on a wide variety of technical discoveries in mathematical, physical, engineering, chemical and medical fields under the general head of "nuclear physics." Many of them already have been read before technical and engineering associations, and many have been published in scientific and technical journals. Official Atomic Energy Commission documents have not yet been declassified and hence are not among the papers now offered by the OTS.

FTC Budget May Be Raised

If one of President Truman's minor budget recommendations is approved by Congress, the funds allocated to the Federal Trade Commission for the trade practice conference program will be doubled. For the fiscal year ending June 30, 1948, $630,000 is asked. This compares with $314,000 for this fiscal year.

The FTC now is working with 30 industries on the establishment of trade practice rules; this is the heaviest load on record insofar as the number of codes under discussion is concerned. It also is a heavy load for the reason that the new philosophy calls for more comprehensive and definitive rules than before.

For example, in holding conferences with the home dye industry—the industry that makes dyes for sale to housewives for use in the homes—there has been a lot of talk about two terms that have been in use—"all-fabric" and "all-purpose" dyes. There has been objection to the use of these terms, for the dyes

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It is reported that . . . . . .

Danielson Mfg. Co. of Danielson, Conn., is making a soft hammerhead of nylon that won't chip or bounce.

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Windshield glass can be kept warm when coated with an electrically conductive transparent film called "Nesa", manufactured by Pittsburgh Plate Glass Co.

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Eastman Kodak's process of molding small lenses in an atmosphere of nitrogen promises, when manufacturing technique is refined, to produce lenses satisfactory for all but the most critical uses.

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General Electric's new silicone paint is said to permit clearer, brighter colors for automobiles, refrigerators, electric ranges, etc., and to "last a lifetime."

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Air Reduction Co. claims to have perfected a method of flame-cutting stainless steel to close tolerances at high speed without affecting the physical properties of the metal.

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American Cyanamid Co. has installed hot water pipes under 600 feet of roadway connecting its plant with the highway. The heat will keep the road free from ice and snow.

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The Mellon Institute has reported on the use of ethylsilicate as a vehicle in paint. Finishes made with it are said to resist heat, retard fire and not to darken with age.

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C. G. Conn Ltd. has an electronic organ that produces its tones by vacuum tubes and is said to be equivalent to an organ with 1,333 pipes.

Bell Aircraft Corp. is making a vending machine mechanism that makes change.

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The Dobeckmun Co. of Cleveland is making an aluminum foil yarn, protected by a plastic surface from corrosion, for use in textiles in combination with other yarns.

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Seal Peel Inc., of Detroit, is sending a shipment of various products, protected only by plastic dip coating, on a round-the-world flight to test the value of this type of packaging in actual service.

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Dow Chemical Company's "Styrofoam" is a pure white cellular insulating material with only 18% of the weight of cork.

Atlas Supply Co., makers of tires and accessories, is showing its wares in a showroom built inside a DC4 and called the "Sky Merchant."

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Linde Air Products Co. calls its method of flame-cutting rock (as for oil wells) "fusion-piercing." It is said to have drilled holes as deep as 450 feet at an average rate of 10 feet per hour.

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The "Solexol cold fractionation" process developed by M. W. Kellog Co. is expected to be used in seven plants now building throughout the world. The process resembles that used for petroleum, but is applied to many basic oils and fats including soy bean, linseed, tallow, sardine and shark liver.

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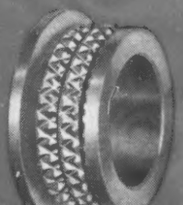
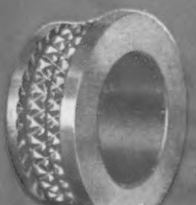
The R.C.A. electronic color television system will be made available to the entire industry.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

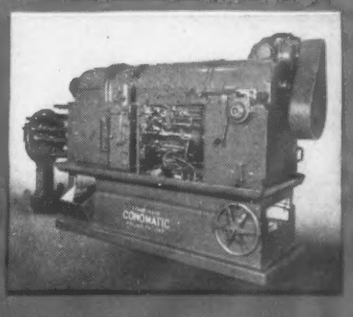
Impressively Conomatic!



This piece was produced from 2⅛" dia. S.A.E. 1112 by 18 tools in 12 seconds on a 2⅝" Eight-Spindle Conomatic.



Any good multiple spindle automatic should handle the ordinary run of work. But the *tough* jobs are profitable on Cones.



Ask your CONE *representative to show you our new color motion picture*

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AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

37

they cover do not serve equally well with all fabrics as a rule, and none of them serves as dyes for glass and metal fibers that constitute the newer fabrics. The final rules, to be set at a meeting with the industry in February, probably will permit these terms to be used provided the manufacturer states on his wrapper the exceptions to them.

Of the 30 industries with which the trade practice conference section of the FTC now is working, 28 opened the negotiations with applications to the commission. This is regarded as an unusual show of interest. The other two grew out of surveys which the FTC made to determine those industries that need trade practice rules to regulate competition. A considerable number of these surveys have been made or are under way, and during the coming months the FTC will invite many of the industries involved to trade practice conferences to the end that rules may be set up.

This idea of making surveys to discover the need for trade practice rules in different industries was first put into practice in 1946 under the new White House mandate to the FTC. Under this mandate the FTC is to "increase its effectiveness by operating on an industry-wide basis, rather than through the slower procedure of individual complaints." The idea is to sponsor a large number of industry conferences designed to locate and eliminate unfair trade practices through co-operative action.

In addition to developing trade conferences for industries that now do not have such trade practice rules, the FTC is actively working up closer liaison with the 156 industries that already have FTC-approved trade practice rules. The purpose is to hold occasional meetings to keep the rules alive and up-to-date and to head off violations.

Will Survey Steel Industry

Following a conference with a delegation representing the American Iron & Steel Institute, Commerce Department officials say they now will go ahead with their plans for a survey of the iron and steel industry. They hope to have their report ready for publication "late in March or early in April." They are uncommunicative as to what the report will show. They say, however, that the final pattern has not been frozen; some conferences still are to be held with steel consumers who are interested in the project.

Commerce, it will be recalled, prepared a survey of the iron and steel industry for the guidance of the Defense Plant Corp. in organizing the wartime iron and steel expansion program. Later this report was revised for the Senate Small Business Committee and made public by the latter. The present project, which was initiated following receipt of suggestions from the automobile industry and other consumers, was originally intended to contain much more information than the Senate committee report.

The new survey is under the direction of H. B. McCoy, director of the Office of Domestic Commerce, George W. Muller, chief of the Industry Division of the Office of Domestic Commerce, and Robert M. Weidenhammer, head of the Machinery and Metals Section, Industry Division.

Small Towns Offered Airport Aid

Producers of miscellaneous airport equipment will find best sales opportunities during 1947 in the smaller communities. To the small cities and towns will go all the money just allocated by the Civil Aeronautics Administration, under the Federal Airport Act, for aiding airport construction during the fiscal year ending June 30.

Noninclusion of large communities in the current allocations results from a provision in the act that the CAA must submit to Congress at least two months before the beginning of the fiscal year a list of the large projects to receive federal aid. Because the act was passed in May of 1946, there was not enough time to get such a list in prior to July 1, 1946. The CAA plans to make up this omission by allocating a proportionately larger share of the 1947-1948 appropriation to large airports.

The federal funds allocated for the current fiscal year come to $33,899,265. Local sponsors will provide an additional $37,692,600, so that the airport program to be launched this side of June 30 will involve direct expenditures of more than $70 million.

The program covers construction or improvement of 800 Class 1, 2 and 3 airports—those suitable for personal flying and local commercial use.

Auto Export Rules Relaxed

A general relaxation in the regulations governing the exportation of passenger cars, motor trucks, busses and bus chassis is announced by the Office of International Trade. New trucks, busses and bus chassis now are under general license and no longer will require validated licenses for export to any Group K country.

Applications for the exportation of used passenger cars for any purpose, including resale, will be approved "within reasonable limits, although a quantitative limitation and general control by country of destination must still be maintained.

An additional monthly quota of new passenger cars has been established to permit "limited" export for business or personal use where the vehicles will not be resold. Within this limited quota exports will be authorized without certification from the manufacturer.

An automobile may be exported as personal baggage under general license provided such vehicle has been in the exporter's possession for 60 days.

Trucks and passenger cars have been removed from the list of commodities excepted from the general in-transit license (GIT) procedure.

Outstanding Limited Production Licenses covering the exportation of new passenger cars produced during 1945 and 1946, and track-laying or wheeled tractors produced or shipped for export since June 30, 1946, have been extended through April 30, 1947.

Motor trucks have been removed from the Positive List of Commodities and placed under general license to Group K countries, but validated licenses are still required for exportation to Group E countries.

Names Mineral Advisory Group

A committee to advise Secretary of the Interior J. A. Krug of the mining industry's viewpoint with respect to national mineral policies has been named by the board of directors of the American Mining Congress, Julian D. Conover, AMC secretary, has announced. This committee was formed at the request of Mr. Krug when he addressed the fall meeting of AMC's Western Division.

Members of the advisory group are as follows, with their respective branches of the industry in parentheses: Howard L. Young, president, American Zinc, Lead & Smelting Co., St. Louis, chairman; James D. Francis, president, Island Creek Coal Co., Huntington, W. Va., (coal); R. C. Allen, vice president, Oglebay Norton & Co., Cleveland, (iron ore); W. W. Lynch, Calumet & Hecla Consolidated Copper Co., New York, (copper); Edward H. Snyder, president, Combined Metals Reduction Co., Salt Lake City, Utah, (zinc); Andrew Fletcher, executive vice president, St. Joseph Lead Co., New York, (lead); Worthen Bradley, president, Bradley Mining Co., San Francisco, (other metals); H. M. Albright, vice president, United States Potash Co., New York, (nonmetallic minerals); and as alternates: Donald A. Callahan, president, Callahan Consolidated Mines Inc., Wallace, Idaho; and S. H. Williston, vice president, Cordero Mining Co., San Francisco.

Plan Alterations In Republic Plant At South Chicago

Proposed installation of rod or bar mill to cost around $3.5 million one of several changes projected

REPUBLIC Steel Corp., which last December was awarded the government-owned South Chicago (Ill.) steel plant for $35 million, plans to alter extensively the facility which it operated for the government during the war and on an interim lease since the end of hostilities.

Republic, according to its bid, proposes to remove a 21-inch billet mill now located on its old property adjacent to that just purchased and install it in line with the 44-inch blooming mill which is part of the new plant. To cost an estimated $375,000, this move will free Republic's old building for additional finishing operations. Republic also plans to install another rod or bar mill in the war-born facilities, to cost around $3,500,000.

The company in addition is giving serious consideration to putting in several 150-ton or larger stationary open-hearth furnaces in substitution for a portion of the electric furnace capacity provided for war requirements. Such furnaces could not be constructed for less than $750,000 each, and their installation would depend on the trend of steel operations in the Chicago area over the next year or two.

Aware of the increased demand for flat-rolled products in the market area which could be served from the Chicago plant, the corporation is also studying designs of mills which could best be fitted into the production schedules at the plant. Such an installation would represent so large a capital outlay, possibly as high as $25 million, that no definite commitments have yet been made for the expenditure of such a sum.

Existing producing facilities at the project will be utilized to a considerable extent. The coke plant and blooming mill will be used to their full capacity, while the blast furnace and bar mill will be operated at 75-80 per cent of capacity.

WAA Begins Sale of Surplus Worth About $3 Billion

About three billion dollars' worth of surplus capital and producer goods have gone on sale throughout the nation under War Assets Administration's "Second Operational Program" which began Feb. 1. Thirty-six national sales of capital and producer goods and 48 national sales of consumer goods will be launched through regional offices during the first few weeks of the four-month program.

Goods for sale include industrial power equipment, abrasives, bearings, cutting tools, metal forming and cutting equipment, iron and steel, valves and fittings, automotive parts, automotive machinery, hardware, plumbing and office machinery.

WAA Withdraws Acceptance of Bid for Foundry

Rescinds action in sale of government-owned plant at Bettendorf, Iowa, following disagreement on machinery

WAR Assets Administration has withdrawn its acceptance of the Bettendorf Co.'s purchase of the government-owned surplus steel foundry at Bettendorf, Iowa, operated during the war by Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., under name of Ordnance Steel Foundry Co. New bids will be taken.

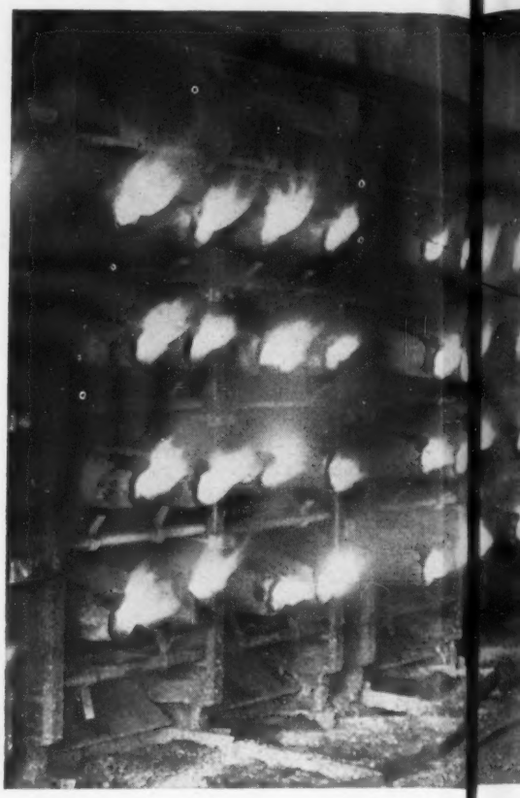
Last September WAA announced that the Bettendorf Co.'s bid of $1,200,839, including $151,000 for raw materials in the plant, had been accepted. Following this it is understood the company and WAA disagreed over who should remove surplus machinery from the premises and the company sought to withdraw its bid. However, the matter was kept alive until the WAA announcement was made.

The WAA Washington office advised its Chicago regional office to "notify all previous bidders on the ordnance steel foundry facility at Bettendorf, Iowa, that the real property board had rescinded its previous action accepting the offer of the Bettendorf Co."

HUGE SURPLUS DETERIORATES: 20,000 army vehicles are rusting away at Ogden, Utah. Gen. Everett S. Hughes, Army Chief of Ordnance, states that he intends to suggest to War Department that equipment requirements be reviewed and material that can be dispensed with sold or junked. He indicates that lack of funds and facilities makes it impossible for the Ordnance Department to give proper maintenance to depots like this

New Records for Zinc Consumption Foreseen

Heavy backlog of demand for zinc-coated steel products gives promise that when steel and zinc supplies permit, usage of zinc for galvanizing will reach new levels. Postwar problems held 1946 consumption 7 per cent below that of 1945



A HEAVY backlog of orders for zinc-coated steel products, particularly galvanized roofing sheets, makes it appear likely that when steel and zinc supplies permit, consumption of zinc for galvanizing will be record-breaking.

In 1946, galvanizing again was the leading user of zinc, on the basis of total tonnage consumed, the 1946 use of zinc for that purpose being estimated by Ernest V. Gent, secretary, American Zinc Institute Inc., New York, as 325,000 tons of the year's estimated total U. S. slab zinc consumption of 793,000 tons. That consumption for galvanizing was slightly less than the 337,181 tons of 1945, but the decline was due to the shortage of steel rather than a shortage of zinc, Mr. Gent pointed out. Another factor contributing to the decline, he suggested, was the holding of zinc-coated steel products for so long at government price ceilings, which, he said, were out of line and made those products less profitable in comparison with other outlets for steel.

Use in Brass Declines

Off sharply in 1946, and lower than at any time since 1938, was the volume of zinc used in brass. The drop to an estimated 150,000 tons in 1946, compared with 259,377 tons in 1945, resulted from labor troubles at the brass mills, the increased use of brass scrap which displaced virgin metal, and the changeover from munitions to peacetime products. If the copper supply is sufficient, increased calls for zinc for brass products may be expected, Mr. Gent said.

Zinc for diecastings reached an all-time peak. The estimated consumption of slab zinc for zinc-base alloys rose to approximately 200,000 tons, and it was pointed out by Mr. Gent that a substantial increase in automobile production would put a heavy burden upon the zinc industry to supply the special high grade zinc that would be needed.

Rolled zinc accounted for consumption in 1946 of approximately 93,000 tons of slab, compared with 91,589 tons in 1945. However, the 1946 figure was far ahead of either 1943 or 1944.

Other uses of zinc brought the total estimated slab zinc consumption in 1946 to 793,000 tons, a 7 per cent decrease from 1945.

Production of slab zinc in 1946 by producers in the American Zinc Institute was 40,000 tons less than in 1945, but, said Mr. Gent, considering strikes, labor shortage, and price control policies it is remarkable that 1946 did not show a greater loss. Output of those producers in 1946 was 759,212 tons, compared with 799,520 in 1945.

Total slab zinc shipped from smelters in 1946 including shipments for domestic consumption, exports and drawback, and for government account was 842,275 tons, 8 per cent above the 777,649 tons which moved in the previous year and about equal to the 1944 total. Stocks at Dec. 31, 1946, were 176,328 tons in comparison with 259,391 tons held on Jan. 1 that year. Thus, 83,063 tons were withdrawn that year to supplement current production and imports. Stocks held at smelters at the end of the year were largely owned by the Reconstruction Finance Corp. This tonnage consists principally of ordinary high grade zinc. If the spread between domestic and foreign ore and metal is such as to enable smelters in the United States to operate with a fair return, production of slab zinc is likely to continue at a good rate as long as the demand justifies it, Mr. Gent said. He added that slab zinc imports will continue to supplement domestic production as long as the relative price in the United States and abroad permits it and consumption warrants it.

In the first quarter, total deliveries matched production, but as production fell, shipments increased and stocks were drawn upon. Except for a decline in deliveries in August this trend continued to the end of the year. After a lapse of two years, and because of higher price levels abroad, the volume of exports again became of real significance, Mr. Gent pointed out. Export and drawback tonnage in 1946 rose to 66,638 compared with only 9422 in 1945. Shipments for government account in 1946 were also substantial, totaling 62,007 tons, compared with 5302 in 1945.

On the basis of overall figures, the available supply and the requirements for slab zinc were substantially in balance, Mr. Gent said. The supply includes current domestic production and imports plus withdrawals from stocks, including those government-owned. While this balance exists in the overall picture, conditions have prevented such a balance in all grades, Mr. Gent pointed out. There has been a shortage of prime western, the principal grade used for galvanizing. If the relationship between the domestic and foreign prices had permitted, it is reasonable to assume, Mr. Gent asserted, that imports of prime western zinc would have continued and gone a long way to make up any deficiency in this particular grade. However, a substitution of higher grades which were available made the situation far less acute than it might have been.

Tightness in the special high grade supply has been much more difficult to solve. The sharp increase in consumption for alloy diecastings enlarged the problem, the 1946 use representing a 53 per cent increase over 1945 and 138 per cent increase over 1939. Here again, if prices in the United States and the world market had been more in line, imports during this period of extraordinary demand might have been maintained at a higher level, Mr. Gent declared.

Final figures are expected to show that slab zinc imports in 1946 approxi-

One of the many steps in providing zinc for industry is pictured here. At a zinc furnace of the Donora, Pa., Zinc Works of the American Steel & Wire Co., a United States Steel Corp. subsidiary, a mixture of zinc ore and finely crushed coal and coke is reduced to a free metal by distillation. The workman is "venting" a condenser to allow gas to escape

mately equaled the 1945 imports of 97,114 tons and that zinc ore imports were substantially below the 1945 receipts of 381,716 tons. While the slab zinc tonnage from Canada shows a substantial increase, Mexican shipments will likely be less than half of 1945. Mr. Gent said it is interesting to note the changes in sources and volume since the peak of ore imports in 1943. Mexico continues as the chief country of origin, with Canada second in importance. Australia, a very large shipper in 1943, was the smallest in 1946.

As to 1947, imports will depend upon metal consumption in the United States, the tariff, and subsidy payments. Both slab zinc and zinc ore are included among the import items as subject to duty reductions in reciprocal trade agreement negotiations.

Mine production of recoverable zinc in 1946 dropped to 565,787 tons, according to preliminary figures from the U. S. Bureau of Mines. In 1945, the output was 611,998 tons.

Premium Price Plan for Copper, Lead, Zinc Revised

To prevent undue diversion of premium money into royalty payments, regulations covering the government's premium price plan for copper, lead and zinc have been revised.

Under the revised regulations the Office of the Premium Price Plan will not approve a royalty rate for any operation which exceeds the rate prevailing on Nov. 10, 1946, when Maximum Price Regulation 356, which governed royalty rates, was revoked.

The revised regulations have been formalized in Stabilization Directive 146.

Recommendation Made on Interim Allocations of Tin

Recommendation that interim allocations of tin metal for the first half of 1947 be set at approximately 50 per cent of allocations recommended for the last half of 1946 has been made by the Combined Tin Committee.

This recommendation of an interim allocation was made to keep supplies moving until more information on supply can be obtained. Later, additional quantities of tin will be available for allocation during the first half of the year.

Total interim allocations, which do not include domestic production, are 10,915 long tons, with 3640 of them for the United States.

Asks Repeal of Excise Tax on Copper Imports

Issue precipitates debate between fabricators and domestic producers. Consumers fear serious shortage

AMONG the latest appeals for action to abolish the 4-cents-a-pound excise tax on copper imported into the United States is one from a copper fabricator, the Scovill Mfg. Co., Waterbury, Conn.

Expressing the belief that a serious copper shortage threatens the United States, the Scovill company urged Congress be requested to seek immediate repeal of the import excise tax.

In recent months there has been considerable debate over the tax, with statements being issued by both proponents and opponents of it. The tax was put into effect in 1932 to protect domestic producers during the depths of the depression.

In helping augment the country's wartime supplies by purchasing foreign copper, the federal government through the Metals Reserve Co. of the Reconstruction Finance Corp. has for the last several years been waiving the tax on all foreign copper it has purchased for allocation to consumers.

Deliveries of copper by the Metals Reserve Co. will terminate at the end of February because it ceased purchasing copper when government price ceilings were abolished on Nov. 11, 1946, and the forward contracts in existence then will be completed by Mar. 1, the Scovill Mfg. Co. pointed out.

While government price ceilings were in effect, private purchase of copper from foreign areas was not feasible because the controlled domestic price was substantially below the world price. However, with elimination of government price ceilings and the rise of the domestic prices to equal or exceed foreign prices it became unnecessary for the government to continue buying foreign copper, government officials said.

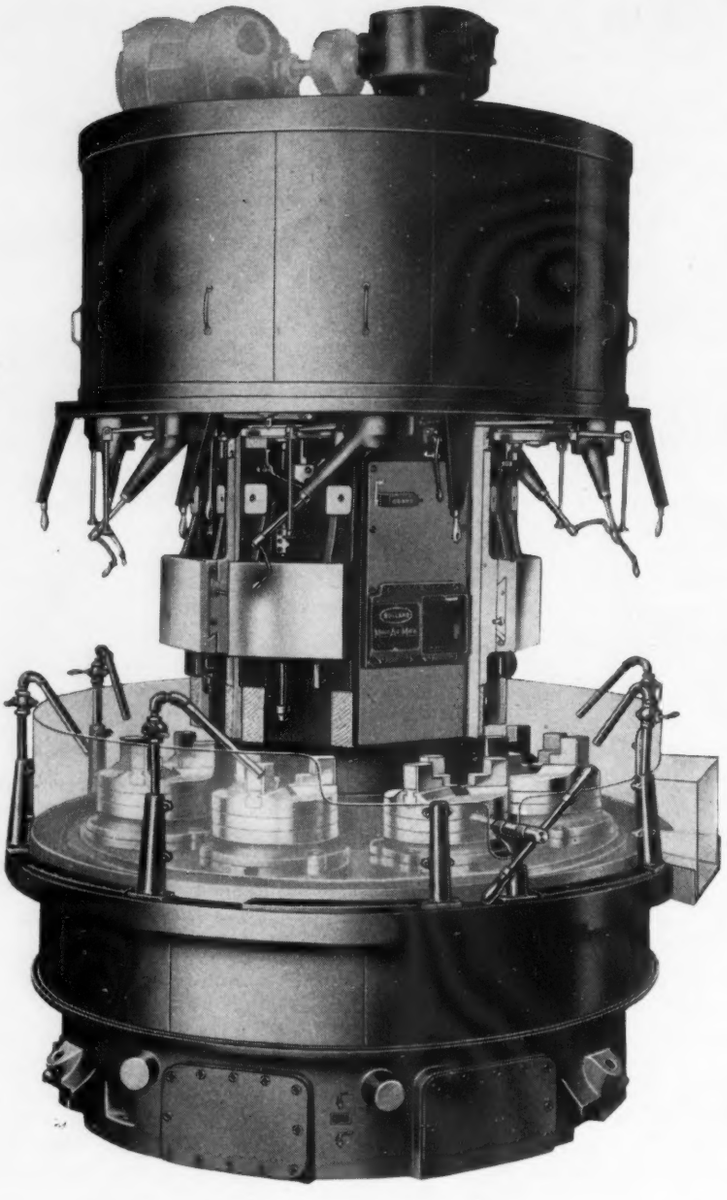
Heavy demand for copper and high domestic prices are now turning private companies and individuals to foreign sources for copper, and with the domestic price above the foreign price the 4-cent tax would have to be collected for the first time since June, 1932.

This has precipitated considerable de-

(*Please turn to Page* 189)

A Special-Purpose Machine for Long Runs

A Versatile Machine for Diversified Schedules



A MULT-AU-MATIC IS BOTH

Bullard Type D MULT-AU-MATICS are made with 6 or 8 spindles in 4 sizes for work up to 23" diameter.

Many Bullard Mult-Au-Matic users tool them up and let them run on the same job for years. No other machine has such an outstanding production record on high-speed, heavy-feed, tough-metal, continuous operation.

Other Bullard Mult-Au-Matic users find short runs profitable because change-over from one type of work is relatively simple. That's because the Universal, Convertible Double-Purpose and Auxiliary heads are quickly and easily set up for new operations. Moreover, each tool head has 82 independent feed rates . . . and each spindle has 41 independent speeds. ***Bullard Engineering Service can help you simplify your retooling requirements.***

Complete data describing the ability of Mult-Au-Matics to make long runs and diversified schedules profitable are contained in Bulletin MAM-D7-6-45.

The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

By A. H. ALLEN *Detroit Editor, STEEL*

Mirrors of Motordom

Automobile output pushing toward new postwar high. January assemblies to approximate 360,000 cars and trucks, slightly under December production. Schedules call for lifting output to about 450,000 units by April

DETROIT

BARRING some unlooked-for hitches, such as the possible shutting off of seat cushion springs from a strikebound L. A. Young plant here, automobile builders last week were expected to push assemblies of cars and trucks across the 100,000-mark for the first time since the week ending July 26, 1941, when the total was 105,635. Highest weekly total reached by the industry in the past ten years was 150,485 for the week ending May 1, 1937.

Going still further back into history to the banner year of 1929, weekly production eclipsed the 150,000 level only in the four consecutive weeks from April 20 through May 18. Thus, in 18 years there have been only five weeks when more than 150,000 cars and trucks were produced, so these periods must be considered exceptional and not representative of peak capacity. If assemblies this year attain a level of 135,000 weekly, they will have reached a normal peak, and there is obviously still some distance to go.

Model Changeovers Affect Total

January assemblies should approximate 360,000 cars and trucks, on a 65-35 basis, compared with 381,000 in December. The 5 per cent reduction reflects the minimum amount of time required for model changeovers in General Motors divisions which have caught up the tempo of late 1946 in remarkably good fashion. With 21 working days, January shows average daily output of 17,190. This should be boosted slightly during the current month which has only 19 working days and, hence, probably will account for around the same total as January.

Since last August, car and truck assemblies have been holding in the 350,000-400,000 range monthly and efforts are being made to step this up in April to 450,000. If they are successful then the 12-month period from August, 1946, should show a production total of well over the 5,000,000 mark. Loud wails to the contrary over recurring material shortages—lack of steel, insufficient castings, not enough copper, too few storage batteries, no tin, etc.—this will be a signal postwar achievement in the making of which suppliers of materials and parts have come to bat in a resounding way.

Probably at no time in the past ten years has the automobile scene appeared as bright and full of hope as at the moment. Prospects of labor unrest are diminishing, with the UAW-CIO apparently steered on a course of statesmanlike collective bargaining, agreeable to extension of expiring contracts and disinclined toward the sword-brandishing conduct of the past. This tranquil outlook could be a smokescreen thrown up in the effort to head off too-restrictive union legislation in Washington, or it could mark distinct progress in improving relations between unions and management.

Ford's industrial relations chief, John S. Bugas, takes an encouraging view of the company's experience over the past year with its UAW contract. For example, in 1945 there were 131 work stoppages resulting in a loss of 767,000 man-hours, but last year there were only 23 work stoppages and only 81,253 man-hours lost. In contrast, national figures show a different picture—4570 work stoppages in 1945 and 4700 in 1946, 38,000,000 man-days lost in 1945 and 113,000,000 in 1946.

The improvement at Ford is not traced solely to the so-called "company security" provisions of the union contract. A material strengthening and reshuffling of the company's industrial relations department may have been an important contributing factor. A sharp decrease in grievance problems has been noticed— second-stage grievances have dropped 50 per cent—and the soundness and efficiency of grievance procedures have been improved, reducing the load of decisions which move to the impartial umpire for resolution.

Bugas feels we are entering a period of great progress in the field of labor-management relations. The gradual shift from the unhealthy atmosphere of a sellers' market to the wholesome discipline of normal competition for the consumer's dollar will have a salutary effect on both labor and management, he believes, by putting a premium on intelligence, understanding, efficiency and united action.

Recognition of mutuality of interest on the part of both labor and management is basic to good relations. The younger Henry Ford has been greatly interested in exploring the attitudes and sentiments of his employees and thus to interpret the working force to the management in the interest of furthering appreciation of mutual interest in the business of building motor cars. He has sent three personal letters and a questionnaire to all his employees, seeking their frank criticisms and opinions. The first two letters drew several hundred replies from the 121,000 to whom they were sent. About 23,000 of the questionnaires were returned and about 90 per cent of them felt the approach had some values.

Automobile Production

Passenger Cars and Trucks—U. S. and Canada

Estimates by Ward's Automotive Reports

	1946	1941
January	121,934	524,073
February	84,141	509,332
March	140,777	533,878
April	248,318	489,856
May	247,620	545,355
June	216,637	546,278
July	331,000	468,897
August	359,101	164,793
September	342,727	248,751
October	410,466	401,369
November	380,460	373,892
December	380,908°	302,518
Total, 12 mos.	3,264,089°	5,108,992

Estimates for week ended:

	1947	1946
Jan. 11	64,828	23,340
Jan. 18	75,166	28,485
Jan. 25	94,345	29,410
Feb. 1	100,000	29,295

° *Preliminary.*

Attention Turned to 48 Models

With most of the 1947 passenger car models reflecting little more than fresh lipstick and face powder, conversation is turning to what may be in store for the 1948 versions, probably to appear this fall. In the case of General Motors, it appears at this stage that new bodies will be introduced only on the larger models in the Cadillac, Buick, Olds and Pontiac series. Cancellation of the entire so-called "A" body program suggests the smaller Chevrolet, Olds and Pontiac will continue with present bodies, probably extensively retrimmed but essentially the same contours. The "B" and "C" bodies are now moving through the experimental stages and are going to embody

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STYLING LABORATORY: This is not a postwar dream car, despite the transparent roof and striking design. Actually it was created more than six years ago by Edward Macauley, head of the Packard Motor Car Co.'s styling division, as a mobile testing laboratory. In this picture, Macauley, second from left, discusses a new styling trick with E. A. Weiss, Packard chassis and advance design engineer

several inches more width, still wider doors on two-door styles and better visions both front and rear.

As to engines, the possibility is seen of new power plants for both Buick and Oldsmobile, perhaps not in all models but likely in the deluxe types. Tooling for an entirely new engine is a costly procedure, particularly under today's rates for tool, die, jig and fixture work, so changes will be gradual and will not be extended to the high-volume models until they have been proved thoroughly.

New Braking Developments

New developments in the field of braking should be unveiled in 1948 models of some of the Ford and Chrysler lines. Kelsey-Hayes has developed a new type of power brake which will be built in its French & Hecht Division plant, and it is understood already to have been approved for use on the Chrysler Imperial and possibly for Lincoln. Air brakes and servo booster brakes are common in the bus and truck field, but their cost has kept them off passenger cars. Simplified and less expensive systems should prove to be valuable plus items at least in luxury-type cars and eventually in all passenger cars. Effortless brake pedal operation will be welcomed by many drivers, even though present systems may not induce much actual fatigue.

Releases Out for Station Wagons

Orders for materials and parts have been placed by Fisher Body Division for a lot of 1800 station wagon bodies to be built at Fisher plant in Cleveland for Chevrolet. These wood units previously have been purchased from an outside builder, and decision for Fisher Body to undertake their construction was prompted by the availability of manufacturing space and equipment in the Cleveland Coit Road plant. Chevrolet and Pontiac station wagon bodies heretofore have been supplied by Ypsilanti Reed Furniture Co., Ionia, Mich. Incidentally, station wagons and convertibles for Pontiac, Olds, Buick and Cadillac, representing only a little over 2 per cent of GM's total passenger car output based on 1946 volume, have been raised in price as much as $193.

Weight in Right Places

Active for over 20 years in the design and development of motor cars lighter in weight than those common in the U. S., Walter D. Appel, chief engineer of Willys-Overland, presented some interesting tabulations on the weight patterns of 13 English, German and American cars, weighing between 1500 and 3300 pounds, in a paper before the Society of Automotive Engineers here last month. He prefaced his remarks by pointing out there is no particular magic about making a car light. It can be done simply by leaving things off and using thinner sections. However, the real technique comes in making the car light and at the same time of acceptable appearance with proper performance, satisfactory road handling characteristics and adequate durability. Certainly in this country at least the vehicle must not be small to the extent of inviting ridicule or of crowding the passengers.

Summing up what the properly designed light car really is, Appel said it is one in which all material has been taken from the wrong place and put in the right place—economically, commercially and technically. For instance, high-priced material is in the right place economically if, only through its use, the necessary life factor or commercial result can be obtained.

Material is in the right place commercially when it contributes to the sale of the product, he said, and it is in the right place technically when it contributes to the mechanism's successful operation.

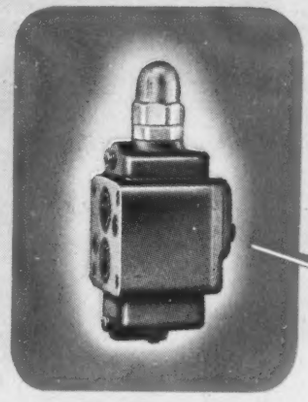
Tinnerman Licenses Shakeproof

Tinnerman Products Inc., Cleveland, has licensed Shakeproof Inc., division of Illinois Tool Works, Chicago, to manufacture and market Speed Nuts and Speed Clips on which Tinnerman holds the patents. Classifications covered include U-type, J-type and latching-type fasteners.

The reasons for this move, according to George A. Tinnerman, vice president and general manager, were a steadily increasing usage of Speed Nuts and Speed Clips and the desire to provide a constant and adequate supply. Shakeproof will go into production during the current quarter.

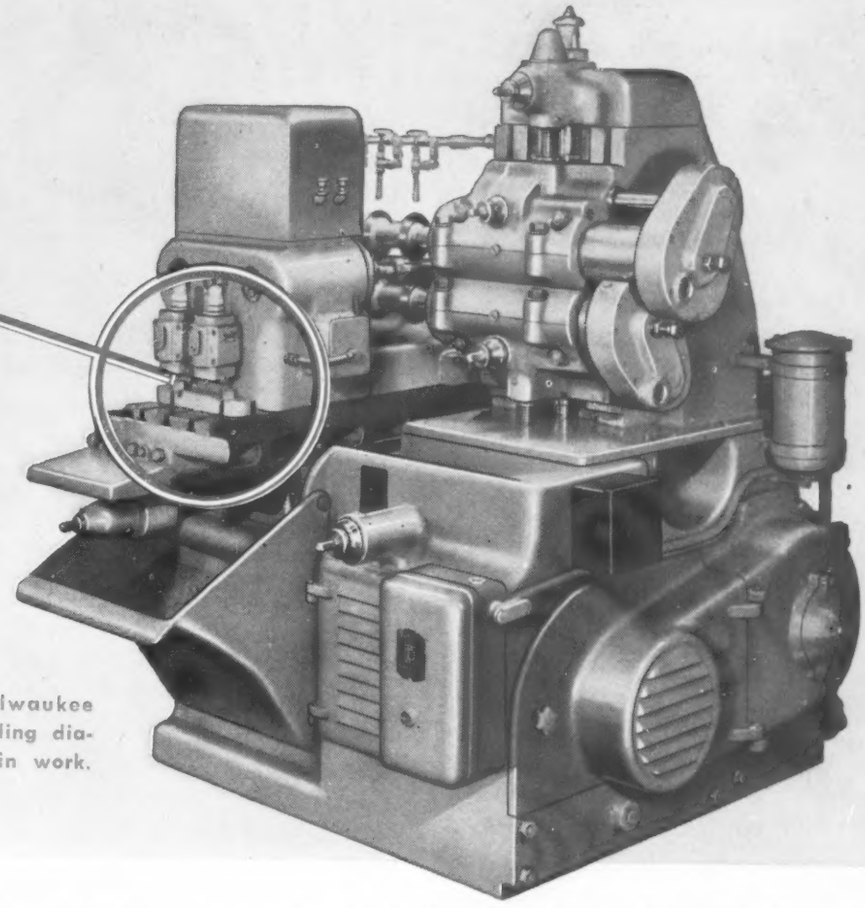
VICKERS HYDRAULIC CONTROLS

Simplify Machine Operation... *Protect* Work and Machine



Vickers Hydraulic Sequence and Check Valve.

This is one of a series of applications pointing out the many advantages of Vickers Hydraulic Controls.



Kearney & Trecker Milwaukee Simplex for multiple milling diametrically opposite slots in work.

This is a representative installation of Vickers Hydraulic Controls featuring interlocking of machine operating phases by a combination of pilot interlocks and pressure sequence control valving. Three work arbors are indexed to position for simultaneous slot milling . . . accurate register and timing being assured by series connected pilot and pressure sequence interlocks. Thus all three pieces are in proper position before cutters approach the work. The same positive interlocking prevents succeeding automatic index until cutters are clear.

Other advantages of these valves: (1) they automatically provide "cushioned" operation, and (2) their ease of adjustment saves set up time when a variety of types of work is to be accommodated.

Our application engineers will be glad to discuss adaptations of Vickers Hydraulic Controls to your products.

New BULLETIN

Bulletin 45-34 on Vickers Pressure Control Valves includes operation, typical applications and installation of unloading, sequence, overload relief and counterbalance valves.

VICKERS Incorporated

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

2346

National Carbon Completes New Vermont Plant

Flashlight case plant, containing 80,000 sq ft of manufacturing floor space, to hold open house Feb. 5-6

OPEN HOUSE at National Carbon Co. Inc.'s new $2 million plant at St. Albans, Vt., will be held Feb. 5 and 6 to permit public inspection of New England's newest industrial facility. The plant, which was constructed for the large-scale production of Eveready flashlight cases, will begin operations immediately and when in full production will employ approximately 400 workers.

The new plant consists of several one-story buildings located on a 56-acre tract. Included are a main manufacturing building containing 80,000 sq ft of floor space, an office building with 6400 sq ft of space, a boiler house, garage, and oil and solvent building. It was built for National Carbon by Gillmore-Carmichael-Olson Co., Cleveland.

Other plants of National Carbon Co., which is a unit of Union Carbide & Carbon Corp., New York, are located at Bennington, Vt.; Cleveland, Fremont and Fostoria, O.; Charlotte, Asheboro and Greenville, N. C.; Niagara Falls, N. Y.; Clarksburg, W. Va.; and Columbia, Tenn.

RUSTPROOFING FOR BRITAIN: A. J. Dawson, left, chief electrical engineer of Albright & Wilson Ltd., manufacturing chemists of Oldbury, England, looks into new rustproofing chemical for steel, called Bannox and developed by Calgon Inc., Pittsburgh. Albright & Wilson have been the British manufacturers for Calgon for many years and is the only firm in England to make phosphorus. Mr. Dawson and C. T. Roland, Calgon chemist and engineer, are inspecting steel slides coated with various materials and tested in salt-fog conversion bath

Niles-Bement-Pond Honors 687 Long-Service Employees

In ceremonies which had to be conducted in two sections, Niles-Bement-Pond Co., West Hartford, Conn., recently honored 687 employees who had from five to 50 years of continuous service with the company.

Thomas Maroney had the longest record with 50 years of service. There were four with 40 years; 21 had worked 30 years; 41 had served 20 years; 139 had been with the firm ten years; and 497 had five-year records.

Crane Co. Is Negotiating To Purchase Allianceware Inc.

A proposal from Crane Co., Chicago, manufacturer of valves, fittings and plumbing fixtures, to acquire the property and business of Allianceware Inc., Alliance, O., will be voted on by the latter's stockholders Feb. 4. If the transaction is made, the Allianceware business will continue to be operated by its present executives and personnel as a division of Crane Co. Present products include porcelain-enameled steel bathtubs, lavatories and sinks.

Cleveland Chain Purchases Chain Works in New Jersey

Purchase of Woodhouse Chain Works, Trenton, N. J., by Cleveland Chain & Mfg. Co., Cleveland, has been announced. The Trenton plant will continue in full operation as the Woodhouse Chain Works Division of Cleveland Chain & Mfg. Co. E. S. Washburn, present plant manager, will remain in the same capacity under the new setup.

Keystone Steel Purchases Own Stock for Retirement

Purchase of 183,902 shares of stock of the Keystone Steel & Wire Co., Peoria, Ill., by that company and its subsidiary, National Lock Co., Rockford, Ill., has been announced by attorneys of the companies and the owners of the stock, the Forest Park Home Foundation and W. H. Sommer. Total cash consideration is $7,356,080, with the terms of the sale subject to the approval of Keystone stockholders, who will act on the proposal at a special meeting Feb. 21.

In the transaction, Keystone will acquire 142,632 shares of the stock, which, according to R. E. Sommer, president of Keystone, will be placed in the company's treasury for retirement. National Lock will purchase the remaining stock.

The transaction, it was pointed out, will reduce the earned surplus account of the Keystone company, but at the same time the company's stockholders will increase their participation in the company's earnings by approximately 23 per cent.

Plan To Improve Wickwire Spencer Steel Div. Plant

Improvements costing from $700,000 to $1 million will be made in the Wickwire Spencer Steel Division's Tonawanda River Road plant in Buffalo. The division, with Carl W. Meyers as president, is a unit of Colorado Fuel & Iron Corp. Alterations will include changes in the boiler house, a new gas house, new wire-drawing equipment and a new annealing furnace.

BRIEFS . . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

Northwestern Steel Co., New York, warehouse steel distributor, has opened a Pittsburgh office at 100 Sandusky St. under the management of Ray D. Copeland, formerly associated with Bethlehem Steel Co. in a similar capacity as district purchasing agent.

—o—

Luria Bros. & Co. Inc., Reading, Pa., has opened a branch office at 1507 Genesee Bldg., Buffalo, with Terry Hanlon as district manager. Mr. Hanlon was formerly associated with Summer & Co., Columbus, O.

—o—

Eastern Stainless Steel Corp., Baltimore, is completing its expansion program initiated over a year ago and designed to more than double the plant's original capacity.

—o—

Linde Air Products Co., New York, unit of Union Carbide & Carbon Corp., plans construction of a new oxygen filling station and acetylene producing plant in Jackson, Miss.

—o—

Business Information Bureau, Cleveland Public Library, has issued a list of manufacturing directories published for each of the states and for Alaska.

—o—

Armour & Co., Chicago, has established a fund of $12,000 for a graduate research program at Massachusetts Institute of Technology for study of mineral flotation. Professor A. M. Gaudin of the institute's department of metallurgy will direct the program.

—o—

Tennessee Coal, Iron & Railroad Co., Birmingham, unit of United States Steel Corp., has awarded certificates to 110 employees in recognition of long service.

—o—

Monarch Machine Tool Co., Sidney, O., has transferred its eastern sales office from Newark, N. J., to New York, 8113 Empire State Bldg.

—o—

Rheem Mfg. Co., Baltimore, plans to complete its present expansion program at Sparrows Point by the middle of the year—a program started more than a year ago and which will double present production, with some 75,000 sq ft being added.

—o—

W. S. Rockwell Co., New York, has received an order for one pusher-type billet furnace, two continuous plate reheating furnaces and one continuous sheet annealing furnace for installation in a large new brass and copper mill in India.

—o—

DeVilbiss Co., Toledo, O., is conducting one-week courses in spray painting for industrial finishers. Remaining sessions start Mar. 10, May 12 and June 23.

—o—

Pittsburgh Plate Glass Co., Pittsburgh, announces construction of a $1 million factory at Long Branch, Ont., Canada, to produce paint, varnish and enamel products.

—o—

Portsmouth Steel Co., Portsmouth, O., plans major expansion of its wire department. To be housed in several new buildings, the department proposes production of oil tempered spring wire, industrial cloth, and other products.

—o—

Metallurgical Engineers Inc., Portland, Oreg., newly formed, plans to provide services in design and development of metal products and processes for manufacturers in the Pacific Northwest.

—o—

United States Air Compressor Co., Cleveland, manufacturer of automotive service equipment, will expand its line of products with addition of a department for manufacture of hose coupling and fittings, air valves and blow and spray guns.

—o—

Aluminum Co. of America, Pittsburgh, has produced four films available for both 16 mm. and 35 mm. sound movie projectors. They deal with brazing and torch, arc and resistance welding.

—o—

Chemical Department, Pittsfield, Mass., General Electric Co., has established a Plastics Division and a Compound Division in place of the former Plastics Divisions. George P. Lehmann will be manager of the plastics section and John L. McMurphy manager of the compound.

—o—

Mathieson Alkali Works, New York, has leased the government ammonia plant at Lake Charles, La. It is a long term agreement with option to purchase. Unoccupied since late 1945, the plant will require four months of preparation before it can be operated.

—o—

Horace T. Potts Co., Philadelphia, iron and steel jobber, has celebrated its 132nd anniversary. Present members of the firm are of the fourth and fifth generations since the founder.

—o—

United Precision Products Co., gage manufacturer, has moved its Chicago office and factory to Shabbona, Ill.

—o—

Alabama State Chamber of Commerce has issued a new industrial directory for the state, listing 3502 industries with 250,000 workers. The first book in 1941 recorded 1988 industries employing 150,000 people.

—o—

United States Rubber Co., New York, is producing a rubber hose for a noiseless riveting hammer at its Passaic, N. J., plant.

—o—

Buflovak Equipment Division, Buffalo, Blaw-Knox Co., has developed a stainless-steel evaporator that concentrates 3500 gallons of tomato juice an hour for use in ketchup and other tomato products.

—o—

Coons & Fuchs Inc., Buffalo, metal fabricator, has acquired the former Seneca Battery Corp. plant in Sloan, N. Y., a Buffalo suburb, for around $50,000. The plant was operated by the U. S. Army during the war under lease from Seneca Battery Corp.

—o—

Refrigeration Equipment Manufacturers Association, Chicago, announces a policy of national refrigeration and air conditioning expositions, centering around the holding of one all-industry show every two years, beginning in January, 1948.

—o—

Plastics Division, Springfield, Mass., Monsanto Chemical Co., has under construction a plant for production of wood flour, key ingredient for phenolic-type plastics. The three-building facility is expected to be in production by May 1.

—o—

Oltman-O'Neil Co., Detroit, is producing steel truck bodies at a rate of 5000 annually after less than one year's operation. Included in current production is a line of octagonal wheel housing van bodies which lower the floor level and overall height by nine inches.

—o—

Leeds & Northrup Co., Philadelphia, maker of electrical instruments and heat treating furnaces, has been given the first annual Industrial Relations Award of the Chamber of Commerce and Board of Trade.

—o—

Bailey Meter Co., Cleveland, will add 14 men to its field force after they have completed their present course in instrumentation at the Bailey factory.

West Coast Buyers Seen Using More Caution in Buying for Inventories

Price uncertainty and better supplies of many materials seen as reasons for less extravagant buying. Continuing steel shortage expected to distort inventory positions and production schedules

SAN FRANCISCO

MANY West Coast manufacturers are beginning to tighten controls on their inventories of raw materials. Frequently this policy is based on anticipation of declining prices for many materials. In other cases corporations are showing increased caution because of price uncertainties. In addition, prospects are improving steadily for increased supplies of many materials, relieving manufacturers of the necessity of ordering blindly far in advance.

One producer of heavy industrial equipment in this area has been buying materials only as needed, gearing purchases to the production line as closely as possible. Inventories of this firm have been reduced about a half a million dollars in the last year.

Another company here which uses large amounts of copper and brass bought heavily of those materials prior to the recent price advance. At present the policy is to restrict ordering and to slow down on inventory accumulations until price uncertainties are resolved.

Order Cancellations Feared

A number of corporations are carrying considerably larger inventories than normal because they feel they are protected by large order backlogs for their finished products. In some cases, however, firms are beginning to fear cancellations of orders which will leave their inventory positions unbalanced. One West Coast machinery maker has started to curtail inventories because of this possibility.

Inventory controls still are affected widely by availability of materials. Continuing scarcity of some items and increasing supplies of others still distort both inventory positions and production schedules. In addition, controls are affected by types of materials used. For instance, fabricators whose principal raw material is steel still are affected widely by the shortage of steel, and they do not expect supplies to become more liberal for several months. As a result they see little likelihood of price reductions on steel and, thus, are ordering liberally.

Reports from Geneva, Utah, indicate that production of the Geneva Steel Co., subsidiary of U. S. Steel Corp., is being restricted by a shortage of ore cars. Although the company has obtained 250 coal cars from Pittsburgh, which have served to relieve a similar shortage of equipment in the coal-hauling operation, no relief has been found for alleviating the ore-car bottleneck.

As a result of restricted ore movements, the plant currently is operating only two of its three blast furnaces and only five of the nine open hearths. The structural and plate mills are working only two shifts daily, five days a week.

Ford May Let Subcontracts For Parts on West Coast

Approximately 2000 parts for Ford and Mercury cars will be displayed in Los Angeles and San Francisco during this month, at which time Ford Motor Co. purchasing agents will ask West Coast fabricators to bid on contracts for manufacturing the various parts displayed. Ferrous and nonferrous metal parts and plastic and rubber parts will be exhibited.

It is understood that the demonstrations are the first stage of a program in which the Ford company may eventually subcontract for a substantial share of its assembly parts on the Coast. With respect to Mercury parts, it is said that 22 per cent of the parts necessary for manufacture of the car may be made in the area.

Two New Chapters of AFA Formed in Western States

Organization recently of two new chapters of the American Foundrymen's Association has been announced by W. W. Maloney, AFA secretary-treasurer. The Rocky Mountain Empire chapter, with headquarters in Denver, will be open to foundrymen and representatives of allied trades in Colorado, Utah, Wyoming, New Mexico, western Kansas, southwestern Nebraska, northwestern Texas and western Oklahoma. The Tri-State chapter, with headquarters in Tulsa, Okla., will serve the region bounded by McAlester, Okla., on the south, Oklahoma City, Enid and Blackwell, Okla., on the west, Wichita, Coffeyville and Pittsburg, Kans., on the north and Webb City and Joplin, Mo., on the east.

Officers of the Denver chapter are: J. L. Higson, partner, Western Foundry, Denver, chairman; W. R. Manske, works manager, American Manganese Steel Division, Denver, American Brake Shoe Co., vice chairman; C. E. Stull, manager, Manufacturers Foundry Corp., Denver, secretary; and J. W. Horner, vice president, Slack-Horner Brass Mfg. Co., Denver, treasurer.

Officers of the Tulsa chapter are: R. W. Trimble, Bethlehem Supply Co., Tulsa, chairman; Anton Johnson, Oklahoma Steel Casting Co., Tulsa, vice chairman; C. A. McNamara Jr., Big Four Foundry Co. Inc., Tulsa, secretary; and Frank G. Lister, Chicago Pneumatic Tool Co., treasurer.

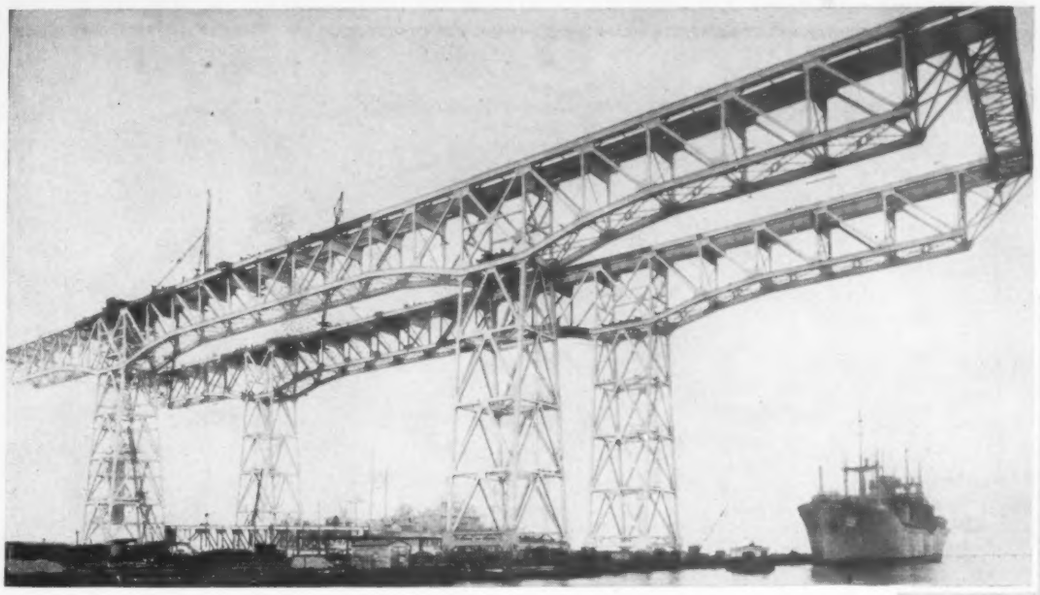
Need for Increased Power Output in Northwest Seen

SEATTLE

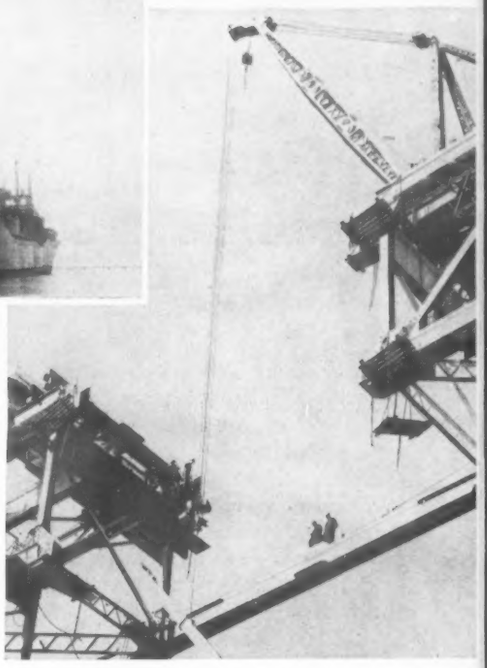
Executives of public and private utilities in the Pacific Northwest, who have long been engaged in a controversy over power production, appear to have reached an agreement of the need for more power. At a meeting in Tacoma recently it was decided to make a united effort to obtain government appropriations that would increase the power output of the Bonneville Administration by 1,565,000 kw by Nov. 1, 1953. Its capacity currently is approximately 1,238,000 kw.

Need for increased power capacity was admitted in the following statement of policy by the utility executives: "It is recognized that provision for future supplies of electric power adequate to maintain continued industrial, agricultural and utility developments in the Pacific Northwest depends upon the construction of multiple-purpose projects on the Columbia river and its tributaries."

Further emphasizing the acuteness of the situation was the disclosure by Paul J. Raver, Bonneville administrator, that deliveries from Northwest power plants in the power pool have reached an all-time hourly peak of 2,574,000 kw, leaving an hourly reserve of only 150,000 kw for the area. These figures compare with a wartime high of 2,233,000 kw. He added that the present reserve would be practically wiped out if only one of the Grand Coulee generators, capable of producing 120,000 kw, were to go out of commission, and stated that Bonneville has already prevented industrial expansions which would have required a considerable amount of power.



Overhead traveling crane capable of lifting a million pounds is shown being erected at Hunter's Point, Calif., in accompanying views



Overhead Crane at Naval Yard Capable of Lifting 500 Tons

AN OVERHEAD traveling crane capable of lifting battleship gun turrets and other huge sections weighing as much as 500 tons is being erected by the American Bridge Co. in the San Francisco Naval Shipyard, located at Hunter's Point, Calif.

Completion of the giant lift will make Uncle Sam fastest on the draw among the nations in the replacing of battleship guns. These large caliber weapons wear down their rifling in a comparatively few rounds and the guns and their turrets are exchanged for new or reconditioned units.

Faster repair service for fighting ships also will be made possible by the lift, which will consist of twin cranes that will operate singly or in tandem atop a bridge type runway 207 ft high. The structure is designed to resist earthquake shocks and high wind loads.

The 730 ft runway spans a pier 405 ft wide, extending 162½ ft over the water on each side. The cranes will run out over the bay where they can operate their main hooks through a vertical range of from 25 feet below to 160 feet above the water level.

Besides a main hook having a rated capacity of 250 tons at a hoisting speed of 10 ft a minute, each crane has an auxiliary hook with a rated capacity of 56 tons lifted at 30 ft a minute. Loads in excess of 250 tons will be lifted by coupling the two cranes. They then will use an equalizer beam which will give them a combined hoisting capacity of 500 tons at 10 ft a minute.

A total of 8400 tons of steel went into the runway structure and the cranes.

Employment in Los Angeles Nears Wartime High Peak

LOS ANGELES

Industrial expansions in Southern California continued to climb during December, and for the seventh consecutive month manufacturing plants in the Los Angeles area showed increases in payrolls, according to a report by the research department of the Security-First National Bank of Los Angeles. In all industrial fields, except aircraft and shipbuilding, expansions now virtually equal the wartime peaks, the report indicated.

Production workers in the area totaled 193,000 in December, representing a gain of 27 per cent over the postwar low of 151,000. The December figure is only 3 per cent below the wartime high of 199,000.

Simultaneous with mounting payrolls, however, was an increase in unemployment claims, which increased for the second successive month. The total number of claims in a typical week in mid-December was 144,000. Four weeks earlier it had been 137,300, and at the end of October was 125,600 for the area.

Rheem Buys Fraser's Gas Furnace, Appliance Line

Purchase Feb. 1 of the entire gas furnace and appliance business including patents, trade name, inventories and some equipment of Fraser Furnace Co. Inc., Stockton, Cal., has been announced by Rheem Mfg. Co., New York. The Rheem company plans to manufacture the Fraser line at the latter company's Stockton plant under a lease agreement and will also produce Fraser products at Rheem's heating equipment plant in Chicago.

Dow Planning $20 Million Expansion of Texas Plant

Dow Chemical Co., Midland, Mich., last week revealed plans for a $20 million expansion of its Freeport, Tex., plant as part of an agreement under which Dow purchased facilities for the production of chemicals from War Assets Administration for over $35 million.

The first of three projects in the expansion is the construction of a $5 million ethylene plant, for which bids are now being received, according to Dr. A. P. Beutel, general manager, Dow's Texas Division. This project is in addition to a $15 million building program now under way which is expected to be completed by the end of the year, Dr. Beutel disclosed.

Men of Industry

T. M. DILS

REBER C. STUPP

R. S. POISTER

T. M. Dils has been appointed plants manager, Delco Products Division, General Motors Corp., Dayton, O. Prior to his new appointment he was chief inspector and manager of inspection and standards for the past 10 years. **Milton E. Feldstein** succeeds him in that position. **C. L. Balbach** has been named to replace Mr. Feldstein as general superintendent of indirect manufacturing and **C. O. Hutchens** general superintendent of productive manufacturing.

—o—

R. T. Stafford has been appointed assistant to vice president, Allis-Chalmers Mfg. Co., Milwaukee. **J. W. McMullen** has been named general manager of the Pittsburgh works of the company.

—o—

G. Lawton Johnson has been appointed assistant general manager of sales, National Tube Co., Pittsburgh, subsidiary of U. S. Steel Corp. He will handle sale of products manufactured at the Christy Park Works, McKeesport, Pa., and some of the company's other fabricated products.

—o—

Walter B. Archer has been appointed Detroit district sales manager for the Hodson Corp., Chicago.

—o—

James H. Marks has joined Dearborn Motor Corp., Dearborn, Mich., as consultant to co-ordinate procurement and engineering of farm implements.

—o—

Ernest W. Pittman has been elected chairman of the executive committee, Interchemical Corp., New York. He has been president since 1937 and is succeeded by **Herbert B. Woodman.**

—o—

Jay Gould Coutant, fuel engineer, has become associated with the Barium Steel Corp., New York, and will supervise the fuel and refractory activities of the Barium subsidiaries in the steel and allied industries.

—o—

Joseph E. Rogers, Cleveland industrialist and president of Addressograph-Multigraph Corp., Cleveland, until his retirement last year, has been elected a director and member of the executive committee of Jack & Heintz Precision Industries Inc., Cleveland. **Reber C. Stupp** was elected vice president and director of the company. He has been associated with General Motors Corp., and for the past 4 years was its plants manager in the three Dayton and two Cincinnati plants.

—o—

Sam Dansker has been appointed export sales manager, Monarch Machine Tool Co., Sidney, O.

—o—

The Carborundum Co., Niagara Falls, N. Y., has made the following changes to the Refractories Division sales organization: **Robert A. Barr,** formerly district sales manager of the Chicago territory, has been named assistant sales manager. He will have direct control of the division's field sales force, and eventually will make his headquarters at Perth Amboy, N. J. **Arthur A. Turner** has been selected as technical assistant sales manager and will be in charge of the sales development department, with offices at Perth Amboy. **Richard D. Rudd** has been named refractories engineer in the Chicago territory succeeding Mr. Barr. **D. Worth Polhemus** has been transferred from the Cincinnati to the Philadelphia district, succeeding **J. G. Fritzinger,** who has been appointed district sales manager for the Abrasive Division in the Philadelphia district. **J. H. Wisby** will take over the Cincinnati territory as refractories engineer.

—o—

R. S. Poister has been appointed vice president, Crucible Steel Co. of America, New York, and will make his headquarters in Pittsburgh. He was formerly associated with Youngstown Sheet & Tube Co., Youngstown, O.

—o—

M. Castellvi, Yoder Co., Cleveland, has been appointed export agent for South America.

—o—

Eugene W. Morris has been appointed vice president in charge of engineering, Luscombe Airplane Corp., Dallas, Tex. He formerly was chief engineer for the corporation.

—o—

Wilson Oelkers has been appointed purchasing agent of the Radio Division, Philco Corp., Philadelphia, and **William Chaffee** has been appointed purchasing agent of the Refrigerator Division of the corporation.

—o—

James W. Birkenstock has been appointed manager of future demands department, International Business Machines Corp., New York.

—o—

C. W. Little has been appointed sales manager of the Heating Division, Fedders-Quigan Corp., Buffalo.

—o—

The B. F. Goodrich Co., Akron, has established a district office of the Industrial Products Sales Division, in Cincinnati. **John S. Gulledge** has been appointed district manager.

—o—

Harry M. Heckathorn, executive vice president, and **Charles A. Morrow,** vice

INDUSTRY BANS RUST AND CORROSION

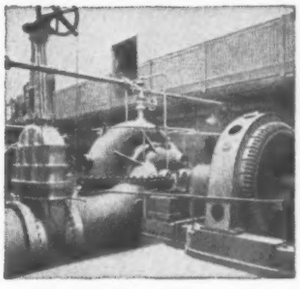
with EVERLASTING FASTENINGS

Few industries can escape the destructive effects of rust and corrosion but *all* industries can reduce their costly ravages in maintenance and breakdown.

Here are six industrial applications where Harper's EVERLASTING FASTENINGS have licked rust and corrosion.

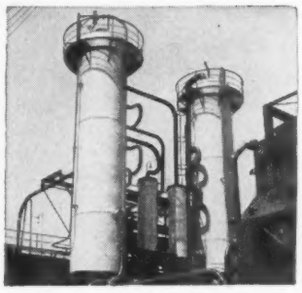
MONEL STOPS CORROSIVE CHEMICALS

Problems in salt production have been solved by using Monel bolts. In mining, treating and handling of many chemicals, non-ferrous alloys are the answer to efficient operation.



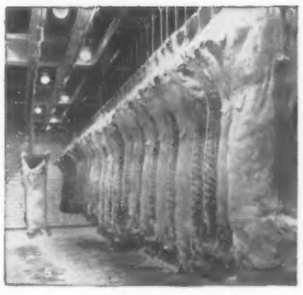
BRASS GUARDS WATER SYSTEMS

In valves and pumps that compose the heart of water works, Brass fastenings help in eliminating the most common cause of replacement—rust.



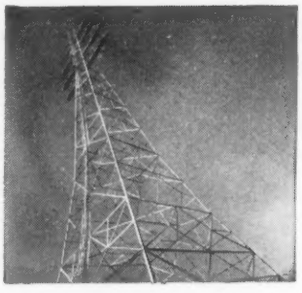
STAINLESS STEEL SOLVES OIL PROBLEMS

Acids and gases at high temperatures attack metal but Stainless Steel alloys cut refinery replacements to a minimum, assure years of continued operation.



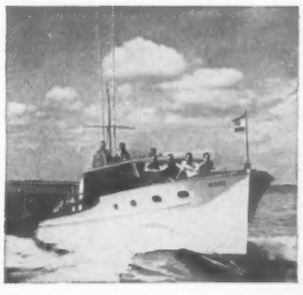
STAINLESS STEEL KEEPS FOOD PURE

Food handling and processing offer many corrosive environments to common steel. Stainless Steel or Monel metal fastenings belong where cleanliness is paramount.



UTILITIES CHOOSE SILICON BRONZE

Weather is the bug-a-boo in power lines and other utility applications. Silicon Bronze Bolts reduce season "cracking" and maintenance costs.



NAVAL BRONZE WINS ON THE SEA

Marine applications demand high strength plus resistance to salt air and water. Naval Bronze fastenings have proved their dependability in marine diesels and ship fittings.

If you have rust or corrosion problems in your industry, it will pay you to use Everlasting Fastenings. Consult Harper engineers or order any of more than 4850 types and sizes of standard fastenings carried in stock.

Branch offices: New York City • Philadelphia • Los Angeles • Milwaukee • Cincinnati • Dallas

Representatives in Principal Cities

THE H. M. HARPER COMPANY
2646 Fletcher Street • CHICAGO 18, ILLINOIS

president, have been elected directors of Mullins Mfg. Corp., Warren and Salem, O.

—o—

Warren H. Hackett and **E. A. Doerschuk** have been appointed assistant treasurers of the B. F. Goodrich Co., Akron. **H. V. Gaertner,** formerly assistant treasurer, has been named controller succeeding **T. B. Tomkinson** who recently retired.

—o—

Colonel G. deFreest Larner has been elected a director of H. K. Porter Co. Inc., Pittsburgh.

—o—

Paul N. Berner has been appointed vice president in charge of sales and advertising for Collman Mfg. Co., Erie, Pa. He was formerly sales manager for Lovell Mfg. Co., Erie, Pa.

—o—

Dr. Gabriel Bosschieter and **Clarence D. Kirkeby** have become associated with the R. M. Hollingshead Corp., Camden, N. J., in its Coatings Division.

—o—

Oscar E. Nordstrom, Norton Co., Worcester, Mass., who has been the Chicago district manager of the Grinding Machine Division for 20 years, has retired from active duty but will continue to act as a consultant. He is succeeded by **Robert D. Lawson,** formerly sales representative for the Norton Grinding Machine Division in northern New England territory. **B. Harold Lewis** succeeds Mr. Lawson.

—o—

Clarence R. Abitz has been appointed general manager, McKees Rocks Works of the American-Fort Pitt Spring Division, H. K. Porter Co. Inc., Pittsburgh.

—o—

Dr. Emerson George has been appointed manager of the New York branch, Berger Mfg. Division, Republic Steel Corp., Cleveland. He is succeeded by **William J. Young Jr.,** as manager of locker sales for Berger Mfg. Division.

—o—

G. Rider Neff and **Frank G. Kaufman** have been named vice presidents, Cleveland Cap Screw Co., Cleveland.

—o—

Henry P. Raid has been appointed chief engineer, Universal Atlas Cement Co., New York, subsidiary of United States Steel Corp. He had been assistant to the president of Universal Atlas Cement Co.

—o—

Stewart Walls, Eaton Mfg. Co., Cleveland, has been promoted to factory manager of the company's Axle Division, and **C. C. Wickson** to plant superintendent of the same division.

—o—

Buford M. Stubblefield, Youngstown Sheet & Tube Co., Youngstown, recently named general superintendent of the Campbell works and steel plant in Youngstown, has been further promoted as Chicago district manager of the company. He succeeds **R. S. Poister** who resigned to join Crucible Steel Co. of America, New York.

—o—

John B. Girdler has been appointed assistant general manager of sales, Vanadium Corp. of America, New York.

—o—

J. Milton Moon has been appointed sales manager, Signode Steel Strapping Co., Chicago. He had been manager of field engineering and research for the company.

—o—

George E. Sibbett, co-owner with **James V. Coulter** of the Coulter-Sibbett Steel Co., Oakland, Calif., has retired. The company will, hereafter, be known as Coulter Steel & Forge Co., Emeryville, Calif. **George Burnside, Bob Traver, Erik Kallin** and **Dick Nelson** continue their association with the firm.

—o—

Herbert Harig, partner, Harig Mfg. Co., Chicago, has been elected president, Tool & Die Institute, Chicago. **E. L. Danielson,** vice president, Service Tool, Die & Mfg. Co., Chicago, was named vice president, and **Stuart H. Sinclair,** sales manager, Federal Tool Corp., Chicago, treasurer. **George W. Rockwood** continues as secretary.

—o—

Douglas C. Yoder and **Edmund H. Kanzenbaugh** have been elected directors of the Yoder Co., Cleveland. **Frank R. Sergeant,** formerly assistant secretary-treasurer, was re-elected director and also promoted to secretary-treasurer to fill vacancy caused by the recent retirement of **Harvey O. Yoder. James Dalgleish,** formerly chief auditor, was named assistant secretary-treasurer. **John Lucas,** president, and **A. C. Husband,** attorney, were re-elected as directors.

—o—

Howard W. Dunbar has retired as vice president and general manager of the Grinding Machine Division, Norton Co., Worcester, Mass. He will be retained as a consultant and will act in an advisory capacity. **Everett M. Hicks** has been appointed assistant manager, Grinding Machine Division. He was formerly assistant controller of the firm. **Dr. Irving Clark** has retired from the position of director of personnel of Norton Co. but will continue to be in charge of the Norton plant hospital. **Harry E. Howard** has been appointed manager of personnel.

—o—

Henry M. Schmitt has been named industry manager, Brown Instrument Co., Philadelphia, subsidiary of Minneapolis-Honeywell Regulator Co., Minneapolis. He is succeeded in his former position

CLARENCE R. ABITZ

J. MILTON MOON

HOWARD W. DUNBAR

KOOLPORE
GRINDING WHEELS

These BAY STATE abrasive products, manufactured with large pore spaces are especially suitable for SURFACING and TOOL and CUTTER jobs that require extra coolness of cut and heavy, fast removal of metal.

Our sales and distributor representation is located in nearly every principal city. Let them, and us, solve your grinding problems.

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.

E. M. SCHULTHEIS

as industrial manager of the Philadelphia branch of Brown Instrument Co. by **O. B. Pyle. I. K. Farley** has been placed in charge of the major petroleum accounts in the Philadelphia area and **Harry D. Ruch** will also work out of the Industrial Sales Division at Philadelphia. **A. W. Roat** has been promoted to industrial manager of the St. Louis branch of the Industrial Division of Minneapolis-Honeywell Regulator Co. to succeed **V. H. Hiermeier** who has been transferred to the Honeywell International Division, and probably will be assigned to a foreign post.

—o—

E. M. Schultheis has been appointed manager of sales, Clark Equipment Co., Buchanan, Mich. He was formerly manager of sales for the Automotive Division. **Leo A. Bixby** has been appointed manager of engineering for the company. **Edwin B. Ross** and **Ezra W. Clark,** vice presidents of Clark Equipment, have retired from active service but both will remain on the board of directors.

—o—

Oren W. Sharples has been appointed factory representative, Continental Screw Co., New Bedford, Mass. He will cover the states of Ohio and Indiana. Mr. Sharples replaces Kenneth R. Corson, who on his return from the service has been assigned an eastern territory.

—o—

Walter C. Weigle has been named to represent the Detroit Die Corp. throughout Wisconsin. He will make his headquarters in Milwaukee. Mr. Weigle has had a long and varied experience in the machine tool and allied fields and for the past eight years has been sales manager and purchasing agent for the Superior Steel Products Corp., Milwaukee.

—o—

John G. Farrar has retired from General Electric Co., Schenectady, N. Y. Formerly comptroller of General Electric, he has been, since last fall, on the staff of the president of the company.

—o—

W. W. French Jr. has been elected president of Moore-Handley Hardware Co., Birmingham, succeeding his father who has been made chairman of the board. **George J. Hearn Jr.,** who has served in the latter position since recent sale of the business, will continue in an advisory capacity as chairman of the executive committee.

—o—

L. M. Nesselbush, vice president, Falcon Bronze Co., Youngstown, has been named general manager of the company. **W. J. Brown,** newspaper executive, has been named a director of the company.

—o—

John S. King, Fairbanks, Morse & Co., Chicago, has been appointed manager of the Chicago branch, succeeding **Frank V. Roy** who retired in March.

—o—

J. W. Myers has joined the Yoder Co., Cleveland, in a sales engineering capacity. He was formerly with the Wean-Broden Construction Co., Cleveland. **Joseph U. Ridder,** recently with the Kane & Roach Co., Syracuse, N. Y., has joined the Yoder Co. as superintendent of its roll grinding department.

—o—

H. J. French has been appointed assistant vice president, International Nickel Co. of Canada, Ltd. He joined International Nickel in 1929 as a member of its Research Laboratories in Bayonne, N. J., and since 1943 has been assistant manager of the Development & Research Division of the company.

—o—

Dr. Karl T. Compton, president, Massachusetts Institute of Technology, Cambridge, Mass., will receive the Washington Award of the Western Society of Engineers.

—o—

T. Albert Potter, president, Elgin National Watch Co., Elgin, Ill., has been elected chairman of the board of directors of the Illinois Manufacturers' Association, Chicago, of which he is a past president.

—o—

R. J. Neville, superintendent of the Ford Motor Co. plant at Edgewater, N. J., has been named plant manager of the new Lincoln-Mercury assembly plant now under construction at Metuchen, N. J.

—o—

The Standard Control Division, Westinghouse Electric Corp., Pittsburgh, has moved from East Pittsburgh to the company's newly acquired plant in Beaver, Pa., and has made the following appointments to the new plant: **C. A. Pickering,** manager of manufacturing; **Leland G. Atkinson,** works engineer; **Eric Perry,** superintendent of manufacturing; **R. W. Scott,** sales manager; **G. C. Woodward,** order service manager; and **L. W. Dyer,** engineering manager.

AUSTIN E. THOMAS

—o—

Austin E. Thomas has been appointed sales manager, Construction Machinery Division, Chain Belt Co., Milwaukee. He has been associated for over 20 years with the construction machinery industry.

—o—

A. W. Weckerly has become associated with the Ft. Pitt Steel Casting Division, Pittsburgh Steel Foundry Corp., McKeesport, Pa. He will serve as a sales engineer.

—o—

George McMeans has resigned as general superintendent, Roebling, N. J., plant of John A. Roebling & Sons Co., Trenton, N. J., to become assistant general superintendent of the Fontana, Calif., works of Kaiser Co. Inc.

—o—

Robert W. Rosin has been named to head the advertising department of Chicago-Latrobe Twist Drill Works, Chicago.

—o—

Christian E. Jarchow, vice president and comptroller, International Harvester Co., Chicago, has been elected a director to succeed the late **Sydney G. McAllister. Merle J. Trees,** chairman, Chicago Bridge & Iron Co., Chicago, a director of International Harvester since 1943, has been elected a member of the executive committee of the board.

—o—

Chester Peterson has been appointed physicist in the resistance measurements section of the National Bureau of Standards, Washington.

—o—

Stuart L. Parsons has been appointed chief engineer for the Tungsten & Chem-

PAUL V. GOODMAN
Appointed director of purchases, Davey Compressor Co., Kent, O. Noted in STEEL, Jan. 27 issue, p. 64.

HAROLD A. HALLSTEIN
Elected executive vice president, Austin Co., Cleveland. Noted in STEEL, Jan. 27 issue, p. 68

HARVEY T. GRACELY
Elected president and general manager, Marion Power Shovel Co., Marion, O. Noted in STEEL, Jan. 27 issue, p. 64

icals Division of Sylvania Electric Products Inc. at Towanda, Pa.

—o—

J. Dan Delanty has been appointed resident salesman in the Tri-Cities area, covering the states of Illinois, Iowa and Nebraska for Bliss & Laughlin Inc., Harvey, Ill.

—o—

James S. Wroth and **Robert W. Barker** have been elected directors of International Mining Corp., New York. Mr. Wroth is a vice president of the company and a mining engineer. Mr. Barker is head of the research department of Adams Express Co., New York.

—o—

The Cleveland Tool & Supply Co., Cleveland, has made the following appointments in the organization: **Charles C. Wright,** chairman of the board and treasurer; **H. E. Ruhf,** president; **O. C. Wittich,** vice president and secretary; **J. R. Coventry,** assistant treasurer; **W. E. Lowles,** general sales manager; **R. L. Fox,** personnel and office manager.

—o—

Dr. H. Ries, Ithaca, N. Y., is chairman and **Peter E. Kyle,** professor of applied metallurgy, Cornell University, Ithaca, is vice chairman of the new Sand Division Executive Committee of American Foundrymen's Association, Chicago.

—o—

W. H. Laughton, general manager, West Coast shipyards, Bethlehem Steel Co., Bethlehem, Pa., has been elected president of the Propeller Club of the United States, port of San Francisco.

—o—

Robert D. Bernhard has been appointed to supervise sales in the Indianapolis territory of the Hewitt Rubber Division of Hewitt-Robins Inc., Buffalo.

—o—

Arthur B. Pike has been appointed representative in the Boston area, Farrel-Birmingham Co. Inc., Ansonia, Conn.

—o—

Laurens H. Fritz has been appointed industrial advertising manager, Sun Oil Co., Philadelphia.

—o—

The Detroit Broach Co., Detroit, has appointed three sales representatives in the Midwest. **Donald F. Wilkes** and **Roy C. Matzen** will cover northern Illinois, eastern Iowa and Wisconsin with offices in Chicago and Milwaukee. **Jack D. Dustman** has been appointed representative for northeastern Ohio.

—o—

William A. Mara has been appointed director of advertising, Bendix Aviation Corp., Detroit. He succeeds **Herbert L. Sharlock** who has been granted a leave of absence.

—o—

L. A. Garber has been elected a director and vice president, Harbison-Walker Refractories Co., Pittsburgh. He also has been named general manager. Mr. Garber is vice president of Northwest Magnesite Co., a subsidiary of Harbison-Walker Refractories Co.

—o—

James P. Cunningham, Luscombe Airplane Corp., Dallas, Texas, has been promoted to vice president of the corporation.

—o—

L. A. Spangler, Westinghouse Electric Corp., Pittsburgh, has been named district transportation manager of the corporation's northwestern district.

—o—

A. Gordon Wilson, formerly with Ekco Products Co., Chicago, has been appointed purchasing agent for Reynolds Wire Co., Dixon, Ill.

OBITUARIES . . .

Clarence C. Hermann, president and general manager, C. C. Hermann & Associates, Detroit, died Jan. 20.

—o—

Elliott P. Ross, 57, died recently at his home, Forest Hills, Long Island. He had retired this year as chief engineer of the Ford Instrument Co., Long Island City, N. Y.

—o—

Robert G. Scott, 52, vice president and general sales manager, Revere Copper & Brass Co., New York, died recently.

—o—

Edward G. Mockly, 58, founder and president, Middle States Foundry & Mfg. Co., Milwaukee, died at his home recently, after a heart attack.

—o—

Marcus Coolidge, 81, died in Miami, Fla., recently. One time manager of the Fitchburg Machine Works, Fitchburg, Mass., and president of the Seneca Falls (N. Y.) Machine Co., Mr. Coolidge also served as U. S. Senator from Massachusetts in 1931-37. After the first World War, President Wilson appointed him special envoy to Poland, representing the Peace Commission.

—o—

William B. Olle, 77, founder and operator of Racine Aluminum & Brass Foundry, Racine, Wis., died in Milwaukee recently.

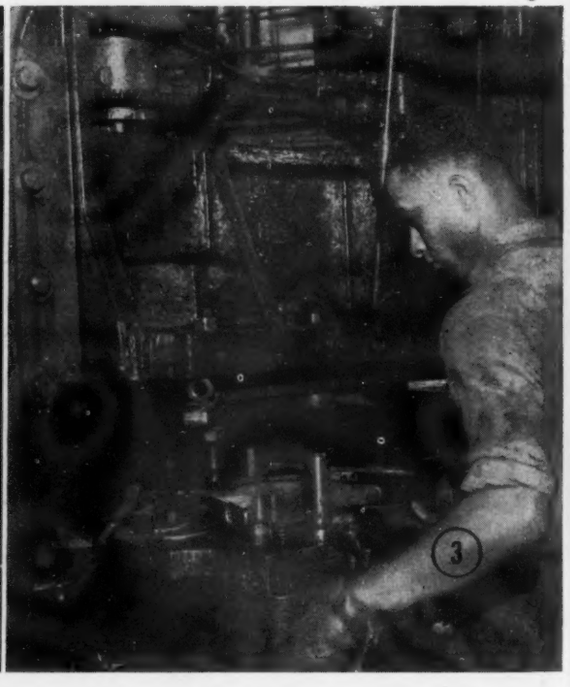
—o—

Robert D. Heflin, 63, eastern sales manager for Gisholt Machinery Co., Madison, Wis., died Jan. 23, in Maplewood, N. J.

Synchronized STAMPING

By DANIEL DEWEY

Vice President and Manager
Stamping Division
Eaton Mfg. Co.
Cleveland



AND PLATING

Close co-ordination of manufacturing facilities necessary to avoid bottlenecks in quantity production of bumper guards, hub caps and other automobile parts. One modern plant geared to a daily output of 10,000 to 15,000 items

SYNCHRONIZED for daily volume production of ten to fifteen thousand vertical bars, hub caps, gas, radiator and oil caps and necks, the stamping and plating facilities at Eaton Mfg. Co.'s stamping division, Cleveland, are representative of the latest equipment used in large-scale manufacture of these much-needed automobile components. The current plating schedule requires about 90,000 amp of generator capacity, 35,000 gal of nickel solution and 3000 gal of chrome solution per day. A complete laboratory is maintained for regular analysis of the cleaning and plating solutions, as well as for determining plate thickness and salt spray testing.

The vertical bars, which are also called bumper guards are made of 12 or 13 gage, cold-rolled SAE 1010 strip, usually with No. 2 finish and No. 4 or No. 5 temper. Most of these can be stamped in three operations: First is a developed blank; second, a form and pierce and the third, a trim operation. These require presses of sufficient tonnage, shut height and stroke to accommodate the dies for the particular size and shape. The pieces have to be carefully polished after the press operations, particularly if they are to be bright nickel plated with no buffing operation afterward. Usually, the ends are polished by hand with a canvas wheel and 140 emery. The sides and tops are finished by running the parts over an automatic polishing machine with 150 and 200 emery.

The company is now nickel plating steel with McGean's bright nickel solution, using a Hanson-VanWinkle 900 to 1000 pieces per hour capacity full automatic tank. The work is first prewashed in a washing machine and then racked, usually six pieces to a rack. The rack then travels through electric cleaners, rinses, acid dip and rinse before reaching the plating tank. After coming out of the plating solution, there is a save, cold and hot water rinse.

The complete cycle takes 72 min and the parts are in the plating solution for 45 min. The regular McGean specifications are maintained as far as the bright nickel solution is concerned. Current density is about 40 amp per sq ft. The result is a bright nickel finish which does not re-

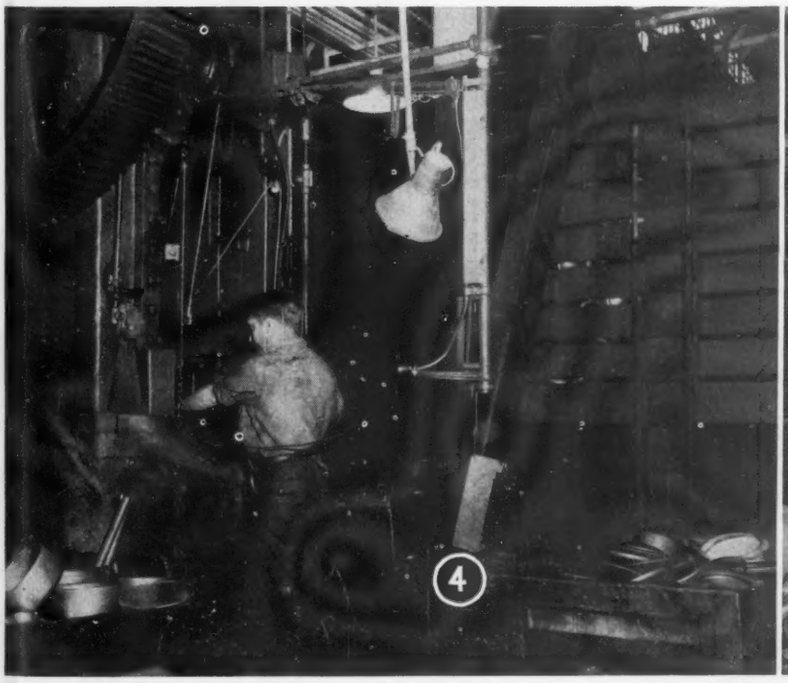
Fig. 1—Hand polishing machines for reaching areas of vertical bars which are inaccessible to straight line automatic polishers

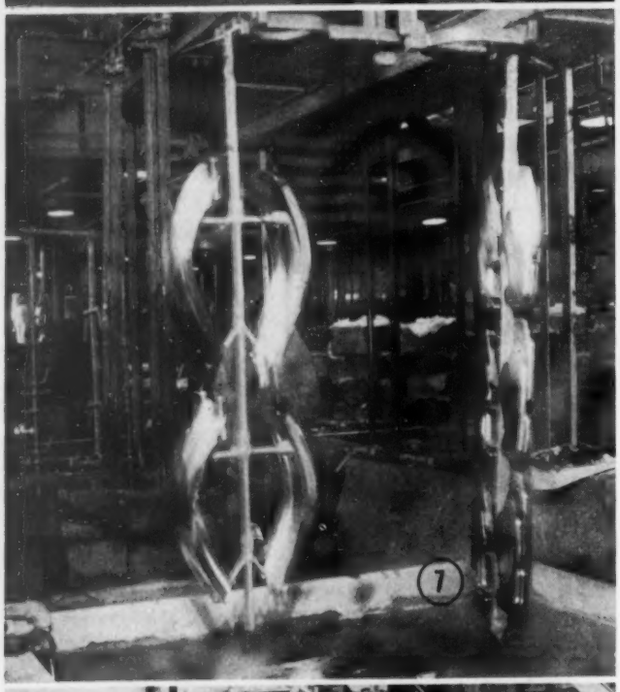
Fig. 2—Two 350-ton Hydraulic presses are used in forming regular shave of hub caps

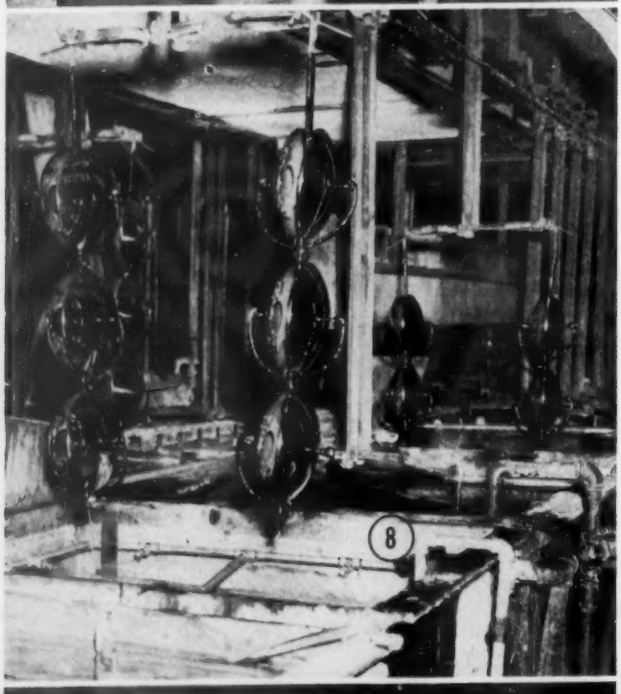
Fig. 3—Trimming bumper cutout on Consolidated double crank punch press. Two vertical bars, or bumper guards, are trimmed simultaneously. Trimming is necessary for bar to fit contour of bumper

Fig. 4—Steel inserts for hub caps are purchased as circular blanks from an outside source, cupped on double action toggle press. A bead is rolled on rim of cup before it travels to press for blow-out to final shape on water die, above. Conveyor at right carries hub caps along to storage bins

Fig. 5—Gasoline tank caps that are to receive paint finish are placed on endless chain conveyor fitted with special adapters which correspond to size of cap to be sprayed







quire buffing and has good adhesion and ductility. The thickness of plate required is 0.0015-in.

Parts are then ready for chromium plating which is done in a regular chrome bath; again with a Hanson-VanWinkle full automatic tank. This cycle includes the regular electric cleaner, rinse, acid dip, rinse, 2½-min in the chrome tank, a save, cold and hot water rinse. Six pieces are used per rack and the total cycle is 15 min. Incidentally, the chromium plating tanks have a capacity of about 750 pieces per hour. The vertical bars are then sprayed with aluminum paint in the inside and packed in suitable cartons for shipment.

The standard type of automobile hub cap is a two-piece assembly. The insert is made of cold-rolled steel with a zinc-plated finish; the outer shell is brass, chrome plated. The insert is stamped from 20 gage strip or circles. First operation is draw and pinch trim, after which a bead is rolled on the edge. It is then expanded in a pressure die to its final shape. A regular zinc-plated finish to withstand 100 hours salt spray test is supplied in a semiautomatic circular type plating tank after the cleaning and rinsing operations. Usually six pieces are placed on each rack.

The shell of the hub cap is entirely brass, approximately 0.015-in. thick. This is stamped from circles and embossed with the appropriate car manufacturer's design. The shells are then cut and color buffed before bright nickel plating. At present, a Udylite solution is being used for this plate and the equipment is the same as used for the steel vertical bars. The plate thickness, however, is only 0.003-in., and therefore the time of the nickel solution is cut down to 25 min. Twenty amperes per square foot of current are used and the shells are racked six pieces per rack. The shells are then chromium plated in a Udylite full automatic chrome tank, with almost the same sequence of operations and time that is required for plating the steel parts.

After being chrome plated, the shells are inspected and assembled to the inserts and crimped or locked in a press. Hub caps are then spray-painted by use of a mask. The paint requires baking at 300° F in an infra-red conveyor-type baking oven, allowing 10 min baking time. The finished hub caps are packed in cartons for shipment with suitable pads or dividers to prevent marring the finish in transit.

Fig. 6—Automatic straight line polishing machine has nine wheels set in line at different angles which thoroughly polish remaining surfaces of vertical bars as they move from one section to the next

Fig. 7—Vertical bars passing through full automatic nickel plating tanks

Fig. 8—As brass shell for hub cap enters the full automatic nickel plating tanks it is dipped first in cleaner to remove superficial stains, grease and buffing compound. Then comes a water rinse followed by an acid rinse to remove any remaining stains. After this it undergoes another water rinse and then passes into nickel bath where coating is applied electrolytically. This is followed by chrome plating mirror finish

Fig. 9—Spray-painted hub caps are baked for 10 min at 300° F in this infra-red conveyor-type baking oven

Air Pressure SPEEDS AUTOMATIC WELDING

New operating principle involves high air pressure up to 1000 psi to control sequences in fast, automatic multispot resistance welding. A second development is a storage battery-powered machine that provides excessive power needed for flash welding aluminum

APPLICATION of new operating principles involving high air pressure to control welding sequences in automatic high speed multispot resistance welding, and use of stored energy to flash weld aluminum were revealed recently in the unveiling of Progressive Welder Co.'s two latest machines.

Under development for 8 years at the company's Detroit plant, the multispot welding machine combines high speed of operation with ability to weld different thicknesses of metal requiring variable welding times, heats and speeds. Said to be faster in operation than "ultra-speed" units, the Progress-O-Matic machine is of simple design, capable of housing a maximum of 60 guns without complicated controls and frequent adjustments.

An air-driven unit that directs the sequencing of the entire machine controls the actuation of the individual guns. This includes application of welding pressure to timing of welds, and controlling amount of welding current heat for each gun. Combination of various features permits a wide variation of welds requiring both long or short welds without penalizing the complete machine cycle to accommodate the longest welds.

As a rotating, or indexing disk uncovers the first port, high pressure air is admitted to the corresponding gun circuit, operating the circuit-closing cylinder on gun No. 1. At the same time the heat-control cams on the drum select the proper heat-control for that gun and the speed control cams adjust the speed of the air motor in accordance with the desired weld cycle for gun No. 1. The two breakers now close initiating the welding current to gun No. 1. At the proper instant, one of the breakers opens, interrupting the welding current.

The disk now indexes, closing port No. 1. Circuit-closing cylinder retracts, opening (*Please turn to Page* 144)

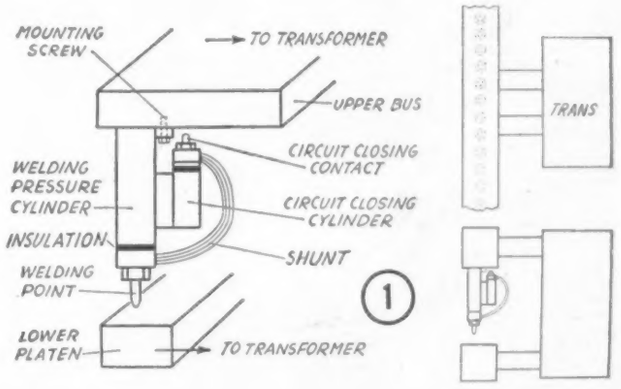
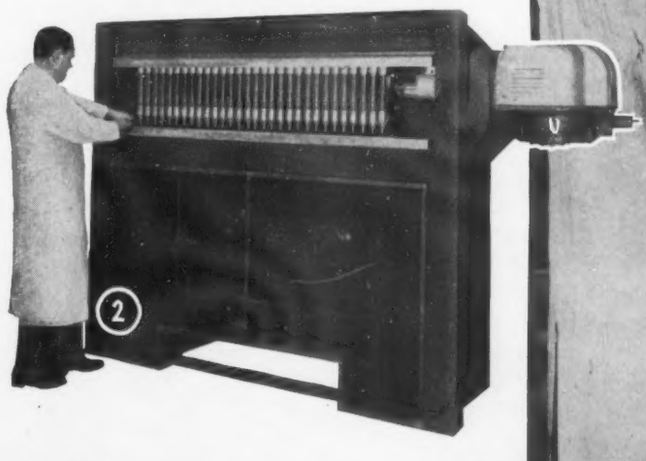
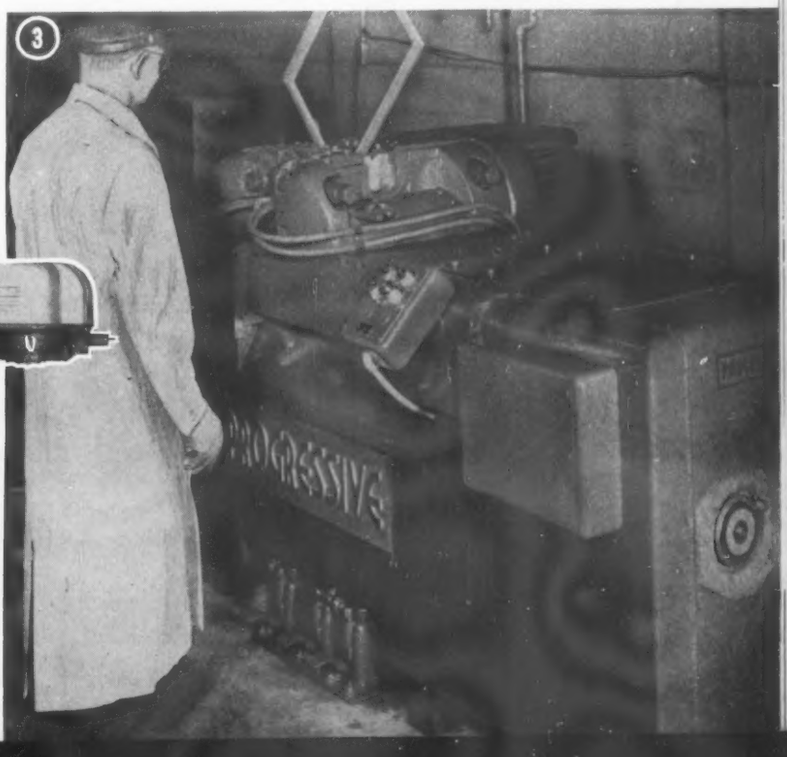


Fig. 1 (left)—Detail of single-screw gun mounting Cylinder at right of gun closes contact for that gun with upper bar just before welding current comes on for gun. (Right) Sketch showing simple electrical circuit of new Progress-O-Matic. Note short low-reactance welding loop

Fig. 2—High speed automatic multispot welding machine is operated by air pressure up to 1000 psi. Housing has 60 ports—one each for a possible maximum of 60 guns. Rotating disk uncovers various ports in sequence

Fig. 3—Flash welding miter joints of extruded aluminum window sash. Battery-powered unit does the job with about the same power requirements as for a 10 to 15 hp 3-phase motor





"LIFE-SAVING" Switch tags

SIMPLE, but effective routine followed by employees in inspecting and repairing machinery at American Rolling Mill Co., Middletown, O., is shown in the accompanying illustrations. It's one that saves lives, not to mention valuable equipment.

Before doing any "trouble shooting," as indicated in Fig. 1, the worker first must open the safety switch on the motor controlling the machine. This cuts off all power. After pulling the swith, he must tie the sign to the switch—not the box—then write his name with chalk on the sign, as shown in Fig. 2. No other person is allowed to close the switch while the worker's name is on the tag. He is fully responsible.

When more than one crew of men work on the same machine, each crew leader, Fig. 3, places his name on a separate tag, ties it to the same switch handle controlling the equipment. The switch then cannot be thrown until all names are off.

If the work is not completed, when it's time to change turns, the person whose name is on the tag must report to his foreman or foreman of the next turn to be relieved of the responsibility. His name then is removed, Fig. 4, and the name of the new man is written in.

The "tag rule," as this procedure is called, was placed in force 28 years ago, following the loss of two lives. It still is effective today.

Output Increased, Maintenance Reduced in New High Temperature Furnace

By JOHN D. KNOX
Steel Plant Editor, STEEL

Silicon carbide heating tubes and hearth rollers operate at 2500°F. High fuel efficiency obtained. Tubes long in experimental service show no signs of deterioration. Heavy roller loads conveyed through furnace either in batches, by indexing or continuously

GAS FIRED, silicon carbide, radiant burner tubes, complete with new type atmosphere ring burners, as well as facilities for conditioning and scrubbing the waste gaseous products of combustion from these tubes have been developed for use as protective gas atmospheres by Gas Machinery Co., Cleveland.

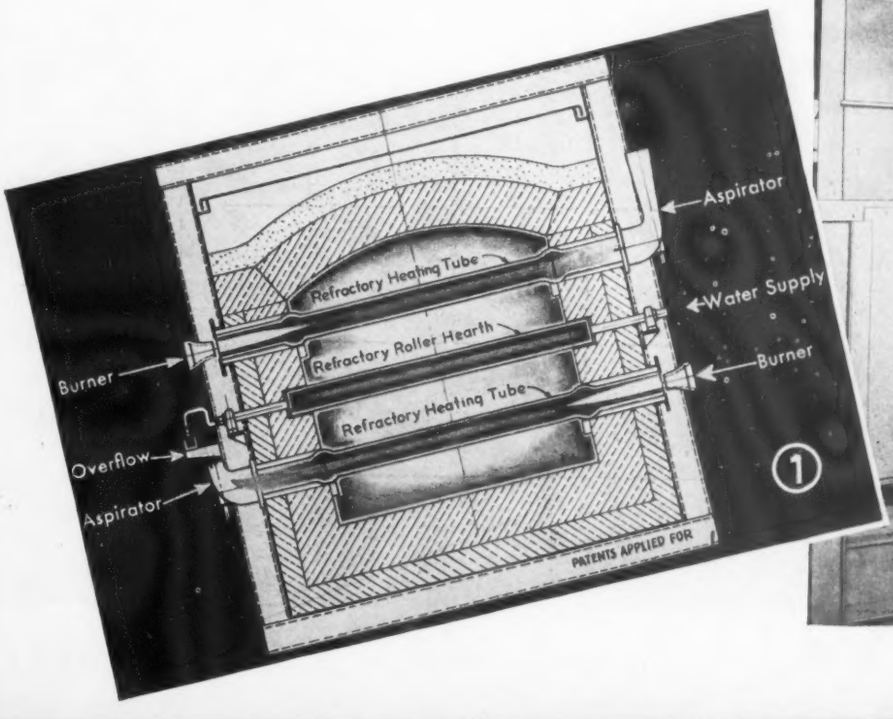
Limitations on the use of refractory tubes for radiant burners have been overcome by a novel tube joint, tube support and tube loading construction. The ends of the silicon carbide tube sections are provided with mating ball and socket joints which are lapped to a substantial gas-tight fit. This type of construction enables any two tube sections to have universal angular movement over a range of several degrees with respect to each other, while the mating ball and socket surfaces are in contact.

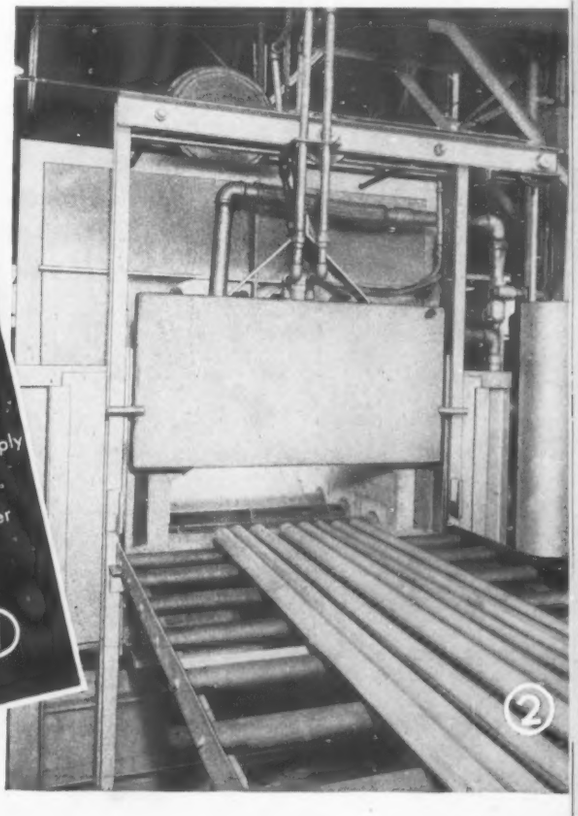
To maintain the mating surfaces in contact and to take care of any change in length of the jointed tube, due either to thermal expansion of the tube or to shortening of the tube resulting from relative angular movements of the sections, one end section is anchored against movement, and the other end section floats against gravity, a spring or sliding counterweight which effects a compression loading. The several sections of a tube are suitably supported, usually from the furnace walls. Each support is deep enough to prevent the sections from buckling from its original plane under compression loading. The supports are usually located at the joints between the sections. Otherwise, since the supports may move with the furnace wall as it shifts in coming up to heat, for example, there might be radius effect which would increase the misalignment but which is taken up by the ball and socket joints. There is no danger of the ball and socket joint opening up due to the sagging of the sections between points of support, for silicon carbide possesses the property of increasing in strength and rigidity at elevated temperature up to approximately 2500° F.

While the ground ball and (*Please turn to Page* 122)

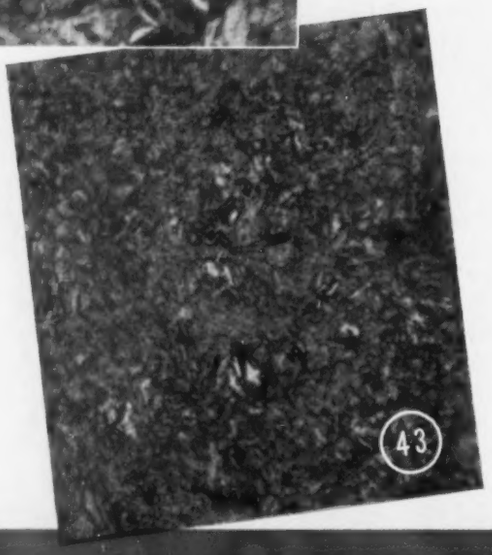
Fig. 1—Section of heating furnace showing position of silicon carbide tubes and hearth rollers

Fig. 2—Charging end of radiant heated furnace showing a portion of refractory roller hearth





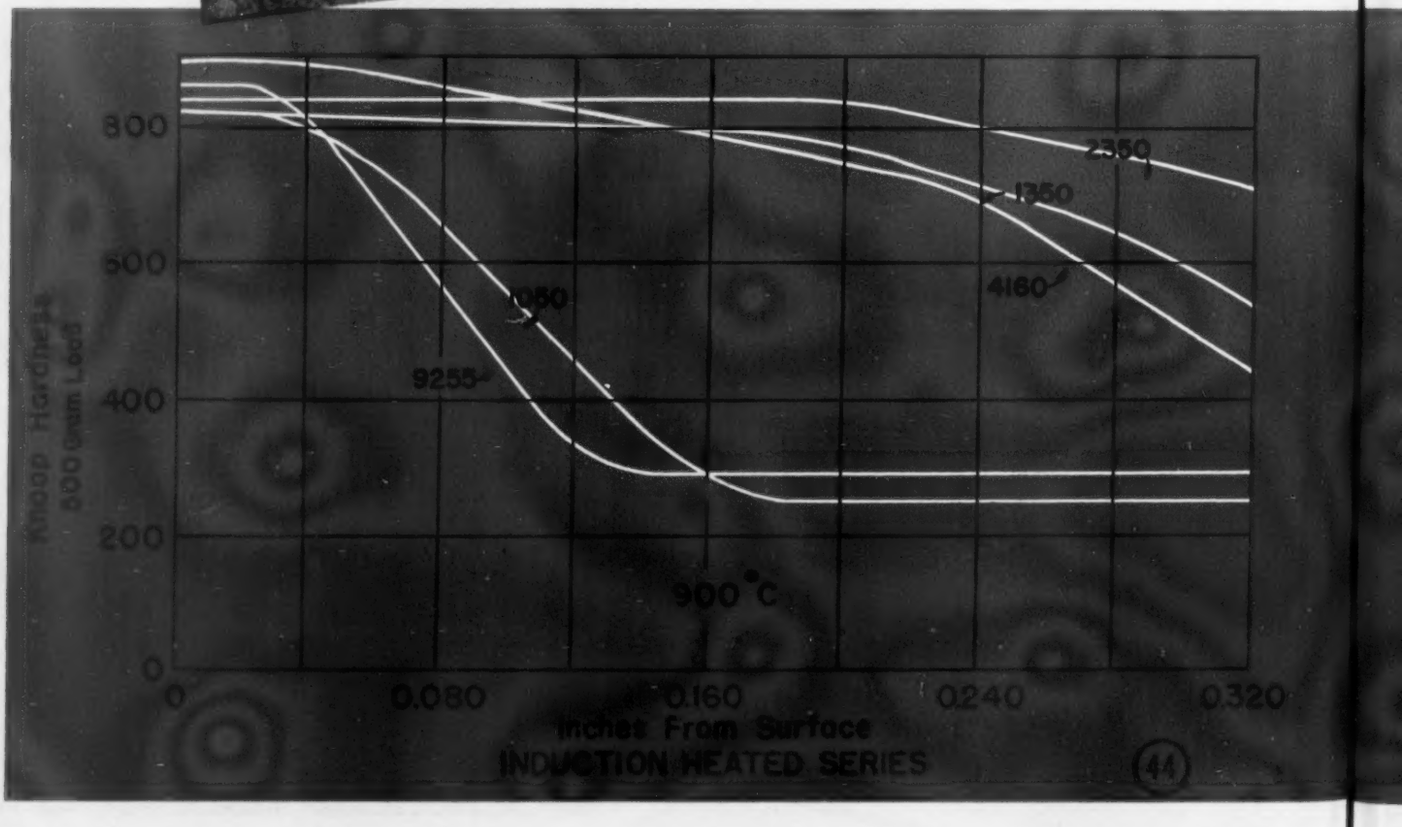
Induction



In the metallurgical discussion of this fourth article of a series, the authors review martensite formation and the influence of alloys on hardenability, martensite tempering, internal stresses and quenching cracks

TO COMPLETE the induction hardening cycle, the heated sample is quenched to transform the austenite to martensite. This requires cooling rapidly to prevent the formation of pearlite or bainite. If the austenite is cooled rapidly enough to prevent these high-temperature reaction products, it will start to transform to martensite at the A_r'' or M_s temperature, and continue to form on cooling down to the M_f point where the reaction is virtually completed[26, 29].

The martensite may be considered to be supersaturated ferrite with the carbon atoms in preferred positions[28]. A direct result of this ordered structure is a tetragonal lattice. The high hardness of martensite is explained to result from the restraining influence of the tetragonality gradients on the slip of the metal. The mechanism of hardening is proposed to be similar to that which occurs for order hardening in the gold-copper alloys where the tetragonality gradients are also a deciding factor[29, 30]. Since the hardening agent in steel is carbon, it is not surprising to find that the degree of hardness increases with carbon content, and that alloying additions have a minor in-



Hardening OF STEEL

fluence on the hardness[31, 32]. A minimum carbon content of about 0.40 per cent is required to obtain a hardness of 60 rockwell C.

Effect of Alloys on Hardenability: One of the main functions of alloying elements in hardening is to increase hardenability; that is, to increase depth of hardening by decreasing the critical cooling velocity for the austenite-pearlite reaction. As a result, a slower quench will still result in the formation of martensite, and for this reason, enable larger masses of steel to be hardened.

Hardenability is of secondary importance in surface induction hardening of steel[18]. Generally, the manganese, silicon, and residual elements found in commercial steels impart sufficient hardenability for most surface-hardening applications where the depth of the martensitic zone is less than ⅛-in. However, occasions may arise where the contour of the surface is such that rapid quenching is not obtained, in which event, deeper hardening, alloy steels may be required.

Hardenability will be of major importance for deep hardening by induction methods. Since manganese and nickel additions improve the austenitizing response as well as increase the hardenability, they are likely to be favored over other elements (Cr, Mo, Si, V, etc.) for alloying additions in induction hardening steels where a combination of deep hardening and high austenitizing response are required. For example, notice in Fig. 44 that the inherent deeper hardening 4160 steel hardened to a shallower depth than the SAE 1350 and 2350 steels when it was induction-heated to a surface temperature of 900°C. The SAE 4160 steel is limited in this instance by its sluggish austenitizing response, and not its hardenability. In contrast, the depth of hardening of the 1050 steel in Fig. 44 is limited by its low hardenability, and not its austenitizing response.

Effect of Alloys on M_s and M_f Temperatures: In addition to their effect on hardenability, alloys have an important influence upon the temperature at which the martensite starts to form (M_s-point), and the temperature at which the reaction is virtualy completed (M_f-point). Most of the common elements added to steel, including carbon, lower the M_s and M_f temperatures[33, 34], the result of this lowering being an increase in the quantity of retained austenite present in the steel when quenched to room temperature. Thus, it is possible to have as much as 50 per cent retained austenite in a quenched 1 per cent C, 4.8 per cent Ni steel[35]. The austenite is a soft constituent, and when present in a quenched steel it will lower the hardness.

Effect of Prior Austenite Structure: In a previous section it was shown that in general the rapid heating by induction does not allow time for homogenization of the austenite (see Fig. 39, STEEL, Jan. 27, 1947). The presence of undissolved carbide, carbon gradients, and free ferrite in the austenitic matrix may influence the transformation of austenite on cooling by promoting the formation of pearlite, and raising the M_s and M_f temperatures.

Since the carbide-phase nucleate the pearlite reaction[36, 37], the presence of undissolved carbides, and possibly carbon concentration gradients, in the austenite will favor the formation of pearlite on cooling—that is, reduce the hardenability of the steel by decreasing the critical cooling rate. In many surface induction hardening jobs this reduction in hardenability is not of great concern, since only a thin layer on the surface is hardened. However, there are undoubtedly times when the loss in hardenability, due to incomplete austenitization, will have undesirable effects, and more attention will have to be given to the austenitizing characteristics of the steel.

The inhomogeneities in the austenite have a marked effect on the quantity of retained austenite present in the quenched steel. This is illus- (*Please turn to Page* 148)

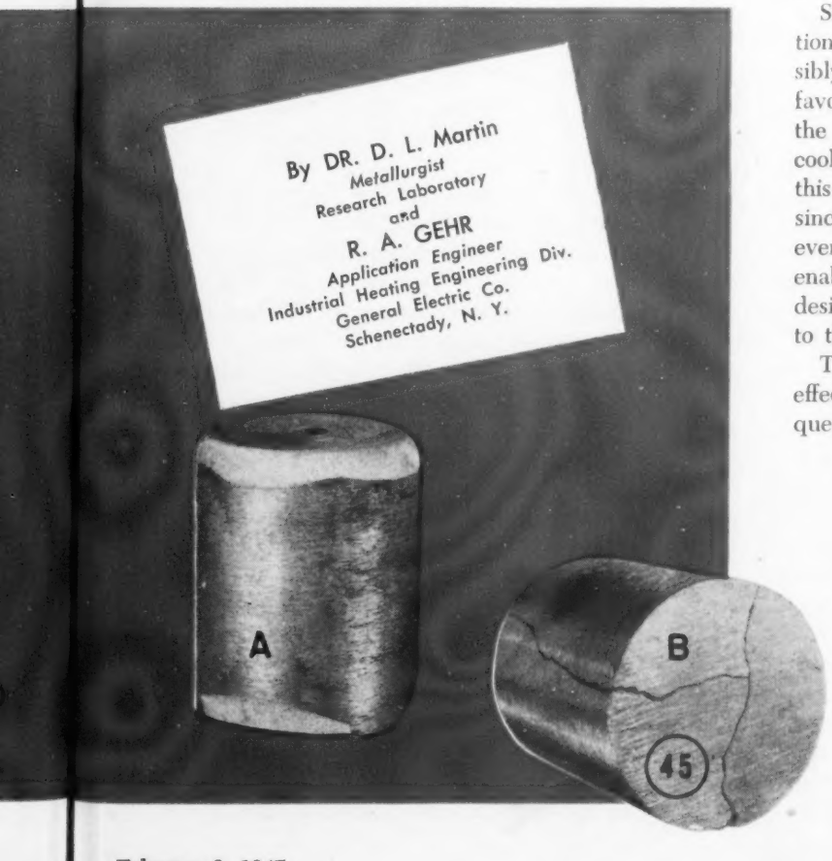


Fig. 43—Comparison of microstructures of quenched samples of SAE 2350 Steel; X1000. Top—Held 2 sec at 850° C; 61 Rc hardness. Bottom—Held 3 hours at 850° C; 59 Rc hardness

Fig. 44—Comparison of hardness penetration curves for five steels induction heated to 900° C

Fig. 45—Fractures which occurred during induction hardening; X1.5. Fig. 45A—Spalling in an eutectoid steel heated to 925° C. Fig. 45B—Cracking in a sample of 1.1 per cent C steel heated to about 1300° C

SOLUTION, AGING AND STABILIZING HEAT TREATING TECHNIQUES, TOGETHER WITH THE VARIOUS FACTORS AFFECTING MACHINING ARE DISCUSSED BY THE AUTHOR

HEAT TREATING AND MACHINING Magnesium

By ALLEN G. GRAY
Consulting Editor, STEEL

MAGNESIUM casting alloys, usually given the designation Dowmetal H, C, and G, (see Table X, STEEL, Nov. 4, 1946, p. 94) are the most commonly heat treated alloys. Three types of heat treatment designated as follows, may be given to these alloys: (1) Solution heat treatment, HT; (2) aging heat treatment, HTA; (3) stabilizing heat treatment, (a) as cast and stabilized, ACS; (b) heat treated and stabilized, HTS.

Solution heat treatment involves treatment at temperatures in the range of 500 to 800° F, depending on the exact alloy composition. It is carried out for the purpose of getting as much as possible of the alloying ingredients into solid solution. Such a treatment results in a high tensile strength, along with maximum elongation or ductility.

Aging at temperatures from 300 to 500° F, after the solution treatment, is given wherever maximum hardness and yield strength are desired.

Stabilizing treatment is given at temperatures from 425 to 550° F. While perhaps falling under the classification of aging, this treatment has some special significance since it may be applied to "as cast" (AC) metal, or after the solution heat treatment in order to obtain rapidly a complete precipitation. The effect of aging at this temperature is to give almost complete stress relief and freedom from growth due to aging in service. When applied following the regular solution heat treatment, a fair ductility is retained due to the coarse nature of the precipitate formed at the elevated temperatures. Indications are that creep strength is highest in the HTS state.

While the matter of growth and stability of magnesium castings is not a serious problem or one that is peculiar to magnesium, yet for certain accurate engine or instrument parts it may prove to be an important factor. It is interesting to note that as cast parts are subject, unless previously stabilized, to about 60 per cent as much growth as the fully solution heat treated castings. The stabilizing treatment is unique in that the growth tendency is for all practical purposes eliminated. This is also the case in standard aging treatments, but in the former case, a higher ductility is retained.

Stabilizing heat treatments should not be confused with "partial aging" treatments that have been used to some extent on magnesium alloys since in the short time at the elevated temperature used for stabilization as much or more precipitation takes place than in the standard long time aging process. Ultimate unit growth data for magnesium alloy castings in various states are given in Table XII. The growth values for sand, permanent mold and die castings are essentially the same. Typical properties

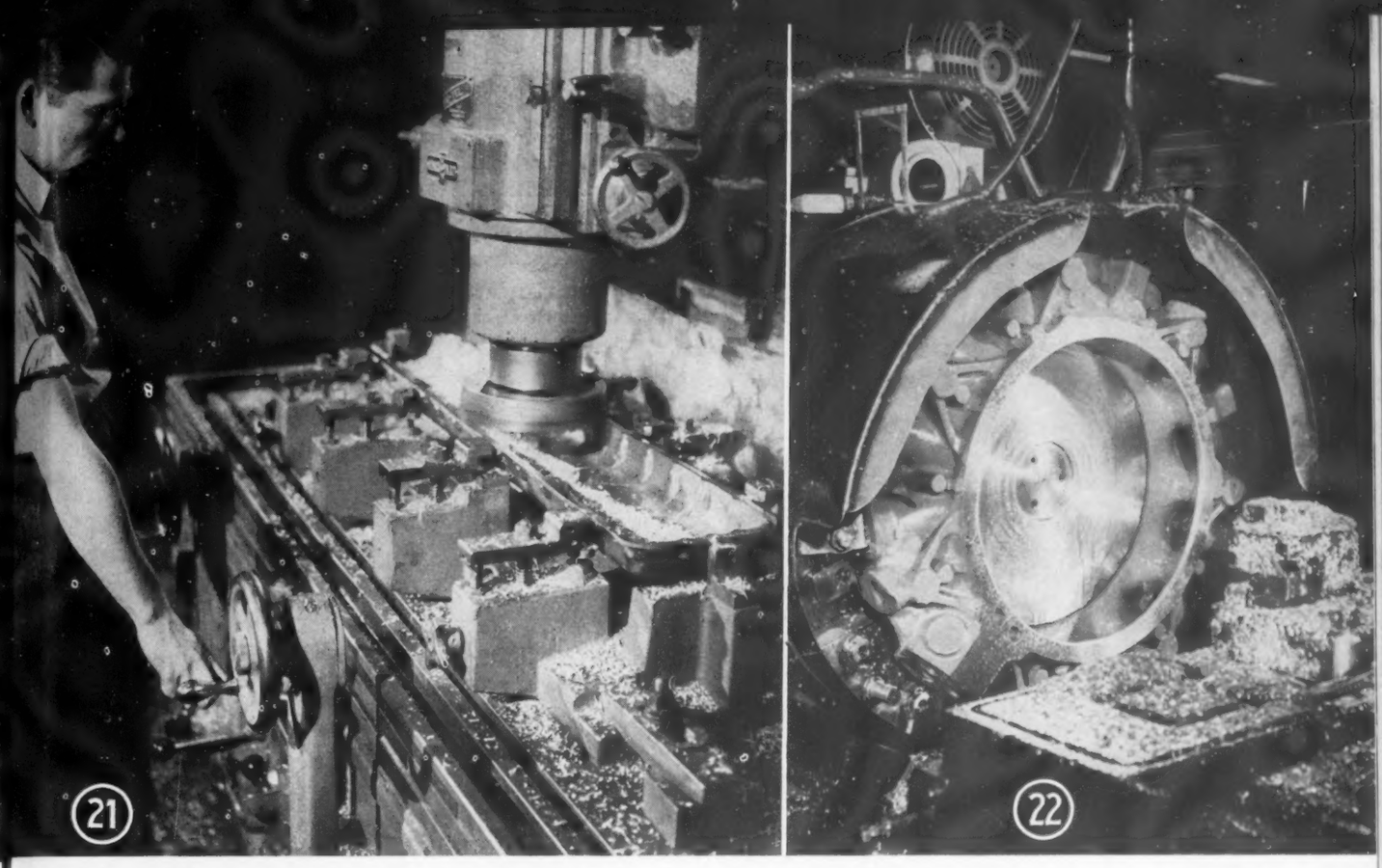


Fig. 20—Typical magnesium castings being placed in heat treating oven
Fig. 21—Surface finishing casting
Fig. 22—Machining magnesium casting. Photos courtesy Dow Chemical Co.

Alloys

as determined on separately cast test bars in various conditions are shown in Table XIII.

Solution Heat Treatment: Heat treatment of magnesium castings is usually carried out before the final cleaning operation. Temperatures and total times for the two common magnesium sand casting alloys are as follows:

Alloy H (A.S.T.M. No. AZ63): Temperature of the casting is raised from about 500° to 730° F, ±5° F, in approximately 2 hours. Casting is then soaked for 10 hours at 730° F, following which it is removed from the furnace and cooled quickly in air.

Alloy C (A.S.T.M. No. AZ92): Temperature of the casting is raised from about 500° F to 770° F, ±5° F, in 2 hours. Casting is then soaked at 770° F for 18 hours, and then removed from the furnace and cooled quickly in air.

Some foundries add several hundredths per cent calcium to the casting alloys; if such practice is followed the heat treatment temperatures should be raised generally about 20° F.

Aging Heat Treatment: The alloys are first solution heat treated according to the schedule given above. All alloys may then be given the same aging treatment consisting of 8 to 16 hours at 350° to 425° F. At higher temperatures, less time is required and elongation runs higher but at a sacrifice in yield strength.

Stabilizing Heat Treatment: This treatment usually consists of heating the castings, as cast, or after solution heat treatment for from 2 to 6 hours at 450° to 550° F. These treatments may be designated ACS or HTS respectively.

Heat Treating Furnaces: Circulating atmosphere, electric, or gas-fuel furnaces are used for the heat treatment of magnesium castings. Direct gas-firing is not recommended for temperatures above 740° F. Indirect gas-firing should be as satisfactory as electric heat from the standpoint of atmosphere control but might be less simple mechanically. For temperatures up to 800° F, sulphur dioxide is a satisfactory inhibitor of surface oxidation at a concentration of approximately 0.5 per cent. Preliminary tests indicate that the use of an atmosphere made by the controlled combustion of natural gas followed by dehydration appears to be a possibility.

Uniformity of temperature throughout the furnace is an important factor for high quality heat treated castings. This has been largely obtained in the modern units through the use of a very high rate of air recirculation and the placing of many thermocouples throughout the furnace to give a check of temperature uniformity at all times. It is important that the controlling thermocouple and mechanism be so placed and sufficiently accurate to make certain that no local areas in the furnace exceed the de-

sired temperature by more than 5° F.

Warpage of the casting is a factor that may require some attention. This can be largely eliminated by properly supporting the casting in the furnace. In some instances special jigs may be required to maintain the proper casting shape; however, in most cases investigation will indicate a manner of placement which will eliminate this requirement.

Rapid cooling after solution heat treatment is quite important. Drastic quenching, such as immediate plunging into a cold bath, should be avoided since it will cause a very marked reduction in properties. It is generally thought that the most satisfactory method of cooling is to remove the castings from the furnace as soon as the treatment is completed and then direct a stream of moving air onto them.

Machining: Magnesium alloys are generally considered to have excellent machining characteristics. Machining can be carried out at high speeds, usually at the maximum obtainable on modern machine tools. Heavier depths of cut and higher rates of feed than are used on other metals are possible with magnesium. Cutting tool life is good. Satisfactory surface finish is obtained because there is little tendency for the metal to tear or drag.

The free cutting action of magnesium produces well broken chips which do not obstruct the cutting tool or the machine. Accurate parts with dimensional tolerances of only a few ten-thousandths of an inch can be made by standard machining operations. The power requirements for removing a given quantity of metal are much lower for magnesium than for other commonly used metals.

Machinability: Certain physical characteristics of magnesium should be taken into consideration in order to secure the optimum results in machining operations from a production standpoint. High clamping pressures tend to cause greater springing in magnesium than in most other metals under similar conditions. For this reason care should be taken when clamping and chucking. Extremely heavy depths of cut and feeds are also apt to cause the work to spring. Reamers and taps must be designed to eliminate the springing of the metal when it is cut.

Temperatures developed when cutting magnesium are quite low, but the low heat capacity and high thermal conductivity sometimes result in magnesium parts becoming heated during machining if a considerable amount of work is performed. Under such conditions, consideration must be given to the possible thermal expansion. The coefficient of thermal expansion, which is 0.0000143 for the temperature range of 70 to 200° F, is approximately equal to that of aluminum and considerably higher than that of steel. An appreciable increase in the temperature of magnesium parts therefore will cause a slight increase in dimensions.

Power required to remove a given amount of magnesium by machining is lower than that required to remove an equal amount of any other commonly used metal. The horsepower per cubic inch per minute normally required for machining magnesium varies from 0.15 to 0.3. Thus the lower power requirements make it possible to take heavy cuts at moderately high speeds.

All magnesium alloys are free machining. The type of chip produced is dependent upon the alloy used, the form and condition of the alloy, and the feed. Rake angles, cutting speeds, and cutting fluids, which exert major influences on the chip formation when machining other metals, have little or no influence on the form of magnesium chips. Unlike most other metals, increasing the feeds used in machining magnesium tends to produce shorter and more completely broken chips.

One of the outstanding machining characteristics of magnesium alloys is their ability to take an extremely fine finish. It is usually unnecessary to grind the metal in order to obtain a smooth finished surface. Surface smoothness readings of 3 to 5 mu in. have been reported for finish turned magnesium. These surfaces are produced at both high and low cutting speeds with or without a cutting fluid.

Tool Shapes: The low temperatures and pressures developed in cutting magnesium allow a wide latitude in choice of tool angles, but special attention should be paid to relief and clearance angles. Relief angles of from 7 to 12 degrees keep the tool flanks from rubbing on the work, and minimize the adherence of chips to the tool. Clearance angles should be larger than those used for other metals to provide larger chip spaces. Best tool life and chip formation are obtained if the rake angles are held from 0 to 15 degrees. They may be increased if it is desired to reduce tool forces, but some tool life will be sacrificed. Smaller rake angles should be used with carbide tools than with high speed steel to prevent chipping.

Values for the end and side cutting edge angles are not critical and are best determined by the conditions of the individual job. However, it is generally best to avoid large side cutting edge angles, to prevent chatter. Since magnesium alloys produce a large volume of chips, it is necessary that chip spaces be considerably larger than those used in tools for other metals. This is especially important in drills, taps, reamers and milling cutters. The nose radii of tools should be relatively small to improve surface finish and to prevent chatter.

Tool Materials: Carbon tool steels can be used for finishing tools, reamers, drills and taps for magnesium alloys. High-speed steel is preferred, however, and is used for practically all drills, taps and reamers. It is also used for other

TABLE XII

MAXIMUM PERMANENT UNIT GROWTH OF CAST MAGNESIUM ALLOYS AT ELEVATED TEMPERATURES

	AZ63 Dowmetal H	AZ92 Dowmetal C
AC	0.00026	0.00034
ACS	0.00012	0.00017
HT	0.00054	0.00076
HTS	0.00027	0.00021
HTA	0.00022	0.00029

TABLE XIII

TYPICAL PROPERTIES OF MAGNESIUM ALLOYS IN VARIOUS CONDITIONS OF HEAT TREATMENT

Dowmetal Alloy	Condition	Tensile Strength psi	Yield Strength psi	Elong. in 2" %	Fatigue Strength 500x10⁶ psi	Brinell Hardness 500 Kg. Load 10 mm. ball
H	AC	29,000	14,000	5	11,000	50
	ACS	29,000	15,000	5	12,000	
	HT	40,000	14,000	12	12,000	56
	HTS	39,000	16,000	8	15,000	59
	HTA	40,000	19,000	5	11,000	73
C	AC	24,000	16,000	2	13,000	65
	ACS	24,000	17,000	2	13,000	
	HT	40,000	16,000	10	14,000	63
	HTS	39,000	21,000	3	13,000	75

TABLE XIV

PROPERTIES OF CUTTING FLUIDS RECOMMENDED FOR MACHINING MAGNESIUM

Property	Value
Specific Gravity	0.79 to 0.86
Viscosity (Saybolt) at 100° F	Up to 55 sec.
Flash Point—Min. Value (Closed Cup)	160° F.
Saponification No. (Max.)	16
Free Acid (Max.)	0.2%

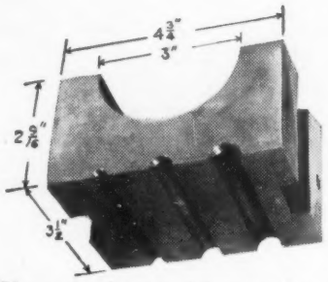
NOTE: Water soluble oils and oil-water emulsions should not be used on magnesium because of fire hazard.

(Inside Rockwell "C" Hardness of Section Cut Midway on 8" Round x 15" Long VEGA. Air Cooled at 1550° F. 1 Hour at Heat)

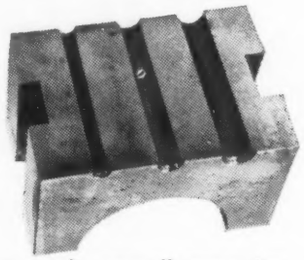
THE *New* AIR-HARDENING TOOL STEEL . . .

. . . SIMPLIFIES HEAT TREATMENT!

. . . HARDENS IN HEAVY SECTIONS!



These chucking and forming dies, first made from an oil-hardening tool steel, "opened-up" .030"/.035" across the 3" diameter. To get minimum distortion in heat treatment, the tool maker changed to VEGA.



As a result, over-all expansion was held to .0004"/.0005"—with no evidence of warpage. And in the tool maker's own words, "VEGA machined in every respect as well as the oil-hardening tool steel previously used."

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types of cutting tools for magnesium, but cemented carbide tools should be employed wherever possible, especially on production jobs. Cast tungsten-cobalt tool materials will exhibit tool life between those of high-speed steel and cemented carbide. Life of high-speed steel tools is improved if carbon content and hardness are maintained high. Surface hardening treatments or chromium plating will greatly improve life of most high-speed tools used on magnesium alloys.

Tool Grinding: Cutting tools may be rough ground with medium-grain wheels, but finish grinding should be done with fine wheels. Finishing cutting tools with a fine-grain wheel will give smooth tool faces and provide good cutting edges. Aluminum oxide 100-grit silicon carbide or 200 to 300-grit diamond wheels should be used for finishing cemented carbide tools. Honing or lapping the cutting tool will give sharp edges, smooth surfaces, and improved tool life. This practice may also be used to recondition slightly dull tools. Tools should not be run to the full extent of their possible life, but should be resharpened when slightly dull to maintain good cutting edges and to conserve tool material.

Cutting Fluids: The purpose of cutting fluids when machining magnesium is primarily to cool the work and reduce the fire hazard. Improvement of surface finish and increase in tool life obtained when cutting fluids are used on other metals are of minor importance in the machining of magnesium. While machining heat may be reduced by correct tooling and machining technique, it is often of such intensity that application of cutting fluids is necessary. Examples of cases where cooling should be employed are the machining of irregular shapes or thin sections which might easily be distorted, and multitool setups which tend to create much local heating.

Efficient machining practice demands that high cutting speeds be used wherever possible. At high cutting speeds, a fire hazard sometimes exists, particularly when fine chips are being produced. Although sharp tools greatly reduce this hazard, and cutting feeds must be in the range of 0.001-in. and less to start fires, uncertainties in operations make it necessary to take precautions.

Iron or steel inserts and sand cast surfaces which are apt to spark when hit with a cutting tool also add to the fire hazard. A stream of cutting fluid, of 4 to 5 gpm per tool, is sufficient practically to eliminate the fire hazard. If a particular job or machine tool prohibits the use of a cutting fluid, cutting speeds should be reduced to below 500 ft per min, and the recommendations regarding sharp tools and feeds rigorously followed. In all machining operations where a low cutting speed is used, magnesium may be safely machined without a cutting fluid, but safe practice dictates that high cutting speeds require cutting fluids.

A wide variety of mineral oil cutting fluids will function satisfactorily on magnesium. Almost any oil will materially reduce the fire hazard if applied in sufficient quantities, but to secure adequate cooling, the cutting oil must have a low viscosity. Since low viscosity mineral oils usually have low flash points, a fire hazard due to the oil is encountered. This fact necessitates a compromise between cooling power and flash point. Table XIV presents the range of properties of the most satisfactory cutting fluids.

Additives which decrease the surface tension and increase the wetting power of the cutting fluids are beneficial. The same chemical nature of magnesium makes it necessary that the free acid content of cutting fluids be below 0.2 per cent and that the use of vegetable or animal oils, which may oxidize and increase the acid content, be restricted. Water soluble oils, oil water emulsions, or water solutions of any kind, although good coolants, should not be used on magnesium. Water will greatly intensify any chip fires which might accidentally be started and also make reclamation of machine scrap very inefficient. The presence of moisture on turnings causes the generation of small amounts of hydrogen which present a definite hazard during shipment or storage. Experience has shown that the use of water base cutting fluids on magnesium is dangerous.

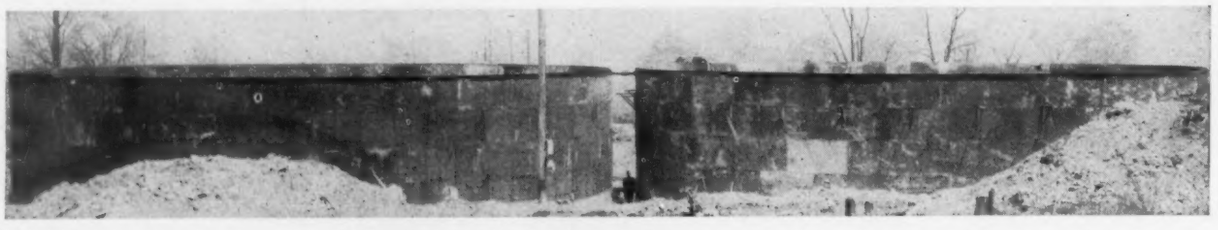
Distortion: Distortion of magnesium parts occurs infrequently during machining and usually can be attributed to heating of the part or to improper chucking. Heating of the work is increased by the use of dull or improperly designed tools and very fine cuts. The high thermal expansion of magnesium alloys results in an increase in dimensions as a result of this heating. This condition must receive special attention to control dimensions accurately, epecially on thin sections where the heat will cause a large rise in temperature. The use of sharp, properly designed tools and relatively large feeds and depths of cut usually prevents excessive heating. An adequate quantity of cutting fluid also will remove the heat developed in cutting and eliminate thermal expansion. Large or massive magnesium parts usually have sufficient mass to absorb machining heat without an appreciable temperature rise, but wide variations in room temperature during machining will cause excessive thermal expansion.

The fact that magnesium will spring more easily than most metals makes it essential that parts be chucked in such a manner that the clamping pressure is applied to heavy sections and that the pressure is not great enough to cause distortion. Special attention should be paid to light parts which might easily be distorted by chucking or heavy cuts.

REFERENCES

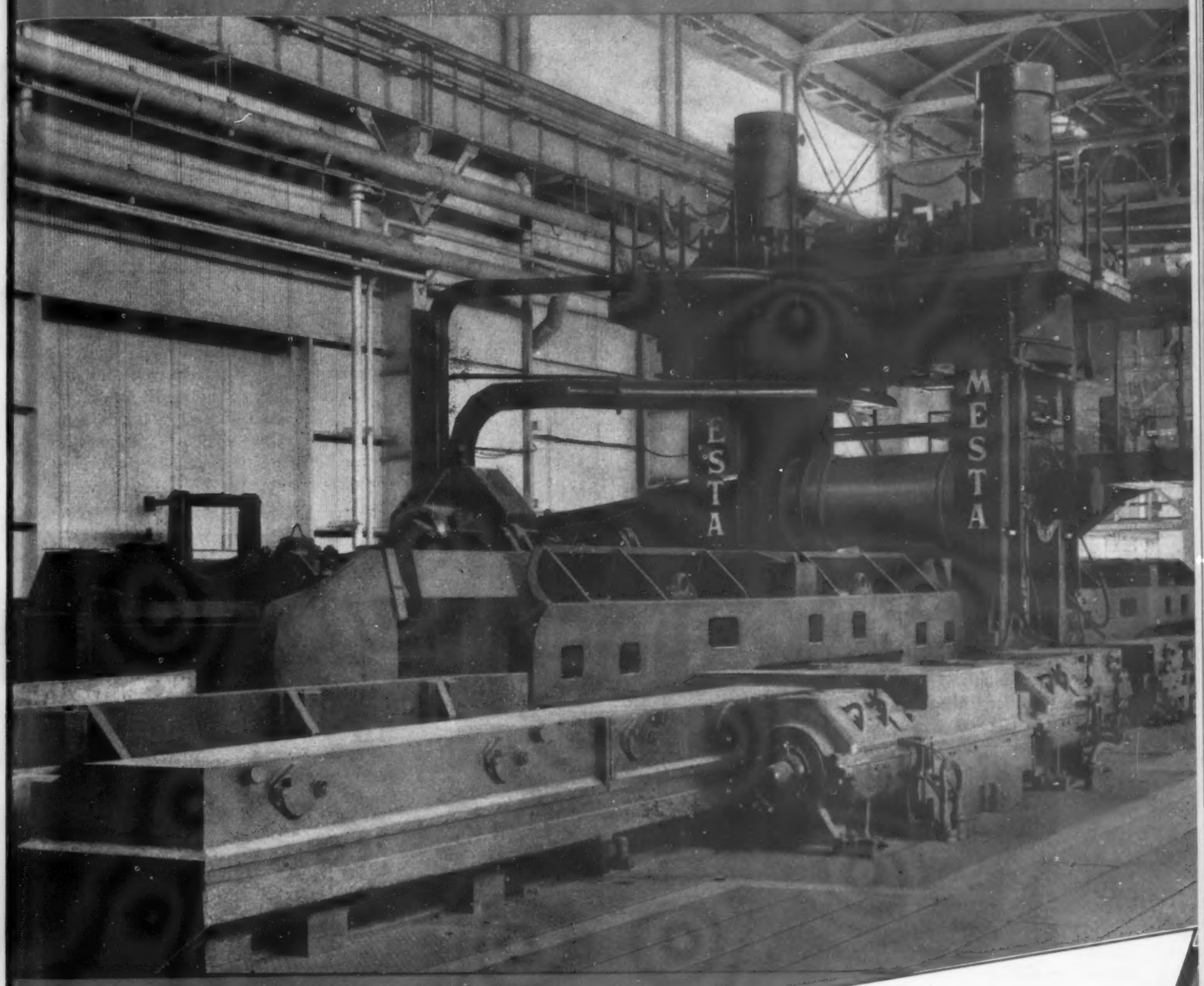
11. Light Metal Age, 2 (No. 1) 1944
12. Data are based largely on information supplied by Dow Chemical Co.

(Continued in later issue)



WROUGHT IRON TANKS: These wrought iron 35,000 bbl storage tanks which served for more than 50 years in the Ohio and Pennsylvania oil fields were purchased by Dow Chemical Co., dismantled, shipped to Marysville, Mich., and the plates used in construction of a new all-welded tank. The tanks are believed to have been of 7-ring construction, approximately 85 ft in diameter and 25 to 27 ft in shell height. First ring was composed of 3/8-in. plate; second and third rings, 5/16-in.; and remaining rings and bottoms, 1/4-in. Plates are reported to have shown no appreciable damage, although it was difficult to find any evidence of paint on the metal surface. Tank bottoms evidently never had been painted. Courtesy A. M. Byers Co.

SLABBING-BLOOMING MILLS



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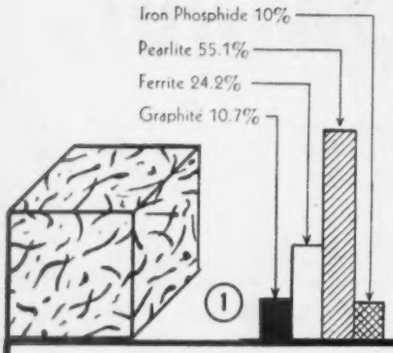
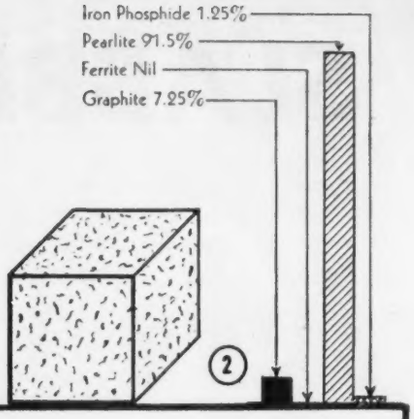




By O. SMALLEY
President
Meehanite Metal Corp.
New Rochelle, N. Y.

A Permanent Mold Material

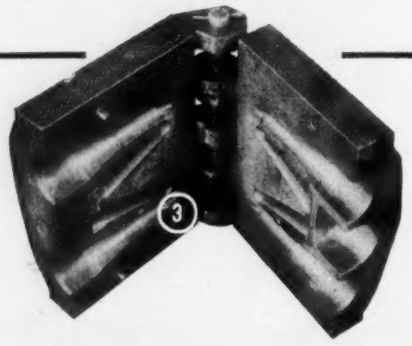
. . . provides consistent uniformity of metal structure

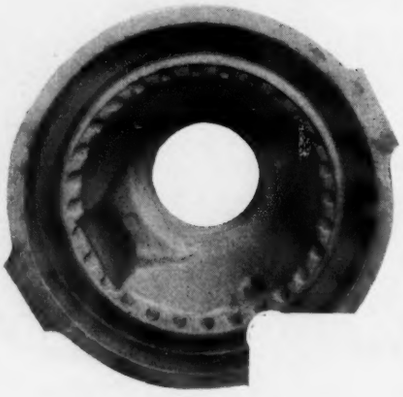
DEVELOPMENT of fields for application of permanent mold castings was stimulated greatly by the unusual demands of wartime production. Many improvements were made, not only in the production of the castings themselves, but in mold materials and design.

Value of permanent molds is measured in terms of length of service life, type of surface finish transferred to the product being manufactured, machinability, freedom from distortion and dimensional changes and resistance to heat checking. Because many industrial applications of Meehanite castings required similar properties, the material is now used widely for permanent molds.

Industry is offered the following classifications: 1. General engineering castings (tensile strengths—30,000 to 55,000 psi); 2. wear resisting castings (brinells—240 to 550); 3. heat resisting castings (nonscaling and nongrowing up to 1600° F); 4. corrosion resisting castings (according to requirements).

Perhaps the chief advantage of Meehanite is consistent uniformity of metal structure throughout variations of casting section. This uniformity insures dependability and freedom from structure failures. To understand this structural property of Meehanite cast iron, it is necessary to examine some factors which influence the mechanical and physical properties of all cast ferrous materials.





During cooling in the mold, iron containing between 2.50 and 4.00 per cent carbon generally solidifies to form one of the following types of structure: The carbon present may be (1) wholly in graphitic condition, (2) wholly in combined condition, and (3) partly in combined and partly in graphitic condition. In those cases where the carbon occurs as graphite, the material is actually a mechanical mixture of graphite in a matrix of ferrite, or of ferrite and cementite—depending whether or not combined carbon is present. The flakes of graphite appearing as black streaks are in reality thin saucers which occur in all planes and intersect one with another to form continuously interlocking graphite structures, giving rise to a relatively porous structure.

The flakes lie at all angles and in all directions, the thickness of the streaks in the photomicrograph indicating the angles at which the section intersects the flakes. In some grades of iron castings the graphite occupies from 10 to 13 per cent of the volume of the casting. Fig. 1 shows in three dimensions the

(*Please turn to Page* 158)

Fig. 1—Interlocking graphite structure of certain cast iron

Fig. 2—Controlled graphite structure of typical Meehanite

Fig. 3—Meehanite permanent mold for bronze. At the time of the service report this mold had produced 11,000 castings, and was still in good usable condition

Fig. 4—Type GB Meehanite shows almost complete freedom from surface checks under Magnaflux inspection after repeated heatings and coolings

Fig. 5—Male and female portions of a complex permanent mold assembly for aluminum castings

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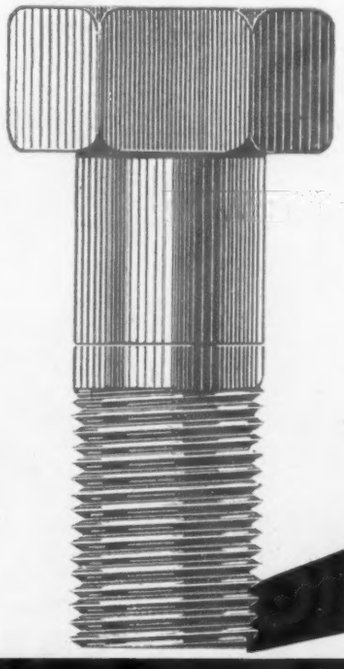
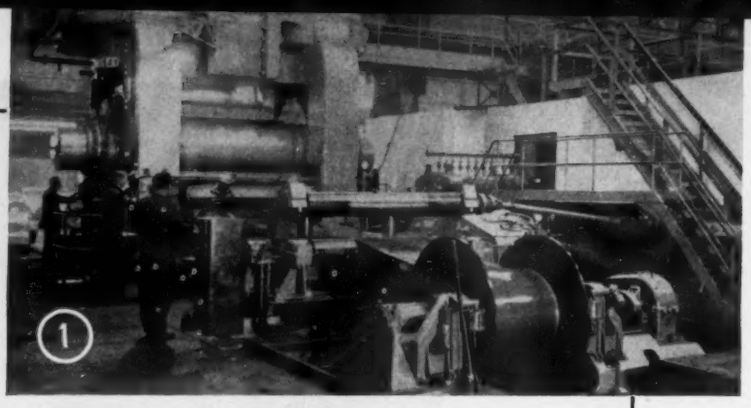


CHANDLER PRODUCTS CORP.

1491 CHARDON RD. CLEVELAND 17, OHIO

New 80-Inch Cold Mill Installed by English Steelmaker



SYMPTOMATIC of the extension and development of the steel industry of Great Britain is a new 80-in. cold reduction reversing strip mill, which is being run in at John Summers & Sons, Ltd. Hawarden Bridge works, Shotton, near Chester. This new mill, the first important unit to be installed since the war as part of the company's pre-determined expansion program, will assist in increasing the efficiency of production of wide high-quality sheets, such as those demanded by the automobile industry and other users of wide sheets.

The mill is a 4-high reversing designed to cold reduce hot-rolled pickled strip up to a maximum width of 74 in. It is equipped with tension reels fore and aft, and with a cone-type uncoiler and pinch roll feeder on the entry side. A maximum coil weight of 10 tons can be handled.

Each housing, of cast steel, weighs approximately 75 tons. The two housings are accurately spaced, and rigidly connected by a heavy cast-steel separator at the top; they are bolted down to heavy cast-steel shoe plates carried on reinforced concrete foundations. Work rolls are 20½-in. diameter of forged steel, rotating in Timken bearings. The backup rolls are of alloy cast steel 53 in. diameter. These rotate in Morgoil bearings and are carried in heavy cast-steel chocks. Pressure is maintained between the top work roll and the top backup roll by hydraulic cylinders mounted in the lower work roll chocks. The rams of these cylinders thrust against the upper work roll chocks. Pressure also is maintained between the top backup chocks and the mill screws by a similar arrangement of hydraulic cylinders and rams in the lower backup chocks. All roll assemblies are withdrawable from the open side of the mill.

Mill screws are 18 in. diameter. The screwdown gear is operated by two 50 hp motors as one unit through the medium of a magnetic clutch coupling the two motor spindles together. Work rolls are driven, through short universal spindles and a pinion stand, directly by a 2500 hp, 93/186 rpm, dc motor.

Two collapsing reels are each driven by two 500 hp, 200/675 rpm, dc motors in tandem through a 3.86/1 reduction gear.

The loads imposed by the strip tension on the reels are carried directly to the mill housing. All drives have been designed to keep inertia to a minimum.

Mill motors are supplied with power from a motor-generator set comprising a 3900 hp, 500 rpm synchronous motor taking current at 6.6 kv driving a 2200 kw 600 v main generator and two reel booster generators of 456 kw ±338 v.

The main mill control is on the Ward Leonard system. Preset and accurate control of strip tension is ensured through the use of Metadyne control.

The pinion stand and the reel gear reduction units have independent oil

(*Please turn to Page* 160)

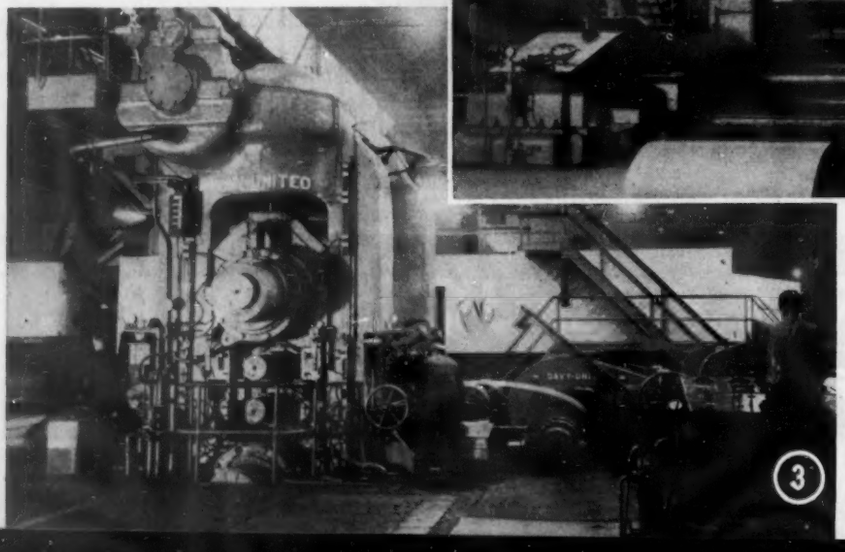


Fig. 1—*Entering end of 4-high reversing cold mill*

Fig. 2—*Exit end of mill*

Fig. 3—*Side view showing control bench at right*

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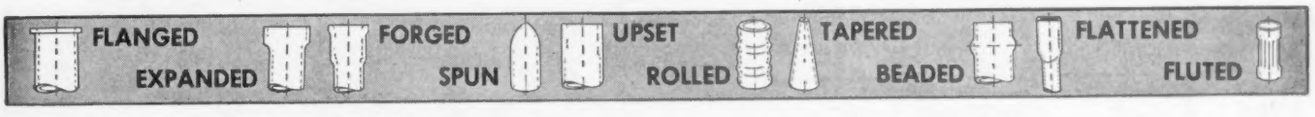

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New Standard on TOOL LIFE

Latest standard for evaluating single-point cutting tools outlines methods for determining cutting-speed tool-life relationship; factors involved in finding tool life in facing tests based on increasing speed. It also presents other data pertinent to the expected performance of cutting tools

By O. W. BOSTON
Chairman
Department of Metal Processing
University of Michigan
Ann Arbor, Mich.

WHEN is a tool dull? Which of several types of tools are superior? What is meant by machinability? These are questions on which there are many different opinions.

The recently approved American Standard on life tests of single-point tools made of materials other than sintered carbides is an attempt to provide an answer to these questions and to outline specifically a method for evaluating single-point cutting tools for use on such machine tools as lathes, turret lathes, boring mills, planers, and shapers. Because carbide tools fail or wear somewhat differently from those of steel and cast nonferrous alloys, a separate procedure for rating them is being developed.

By "machinability" is meant the ability of a metal to be machined satisfactorily or the ability of a cutting tool to perform satisfactorily, or even the ability of a cutting fluid to facilitate the cutting operation. Good machinability implies satisfactory results in machining. It is manifest by any one or a combination of several results as follows: (a) Long tool life or high productive capacity; (b) good surface quality of the machined surface; (c) well broken-up chips which are easily disposed of; (d) low power consumption in removing a given quantity of material; (e) uniformity in dimensional accuracy of successive parts.

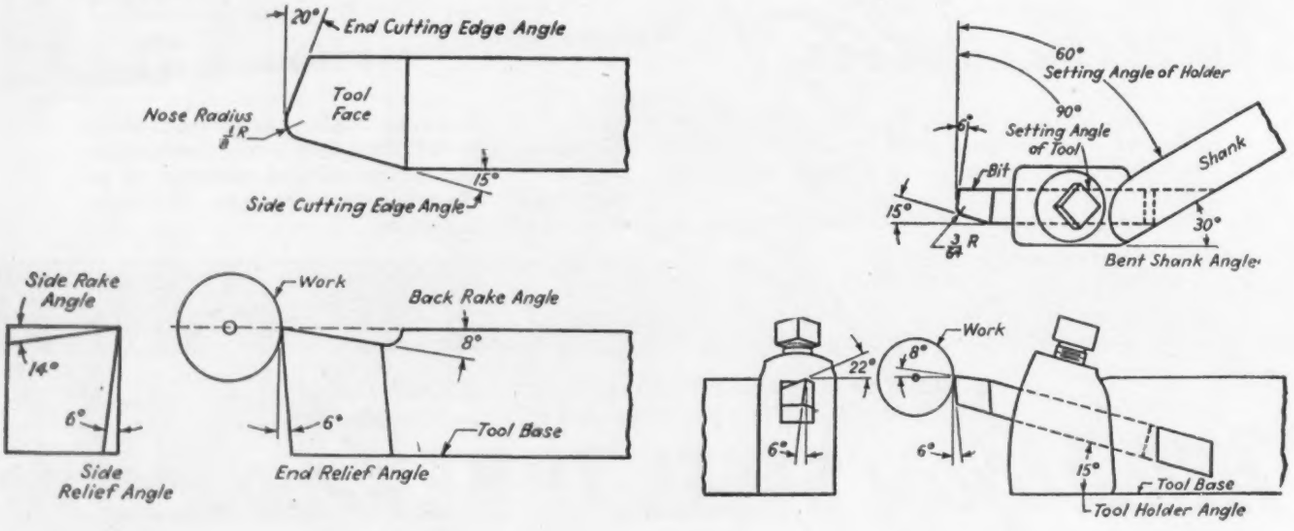
The performance of a cutting tool is definitely associated with the material being cut and the cutting fluid being applied. Its performance is a function of its material, its shape and size. Machinability is not a basic standard but is relative. The rated machinability of two or more tools may vary for different processes of cutting, such as heavy turning, light turning, or forming, as well as for other processes.

The purpose of the new American Standard is to present a means by which the wear on a tool can be used to determine its life between grinds so that different agencies can evaluate various tools and have their results comparable. The standard has been prepared to provide a wide range of testing conditions to meet as nearly as possible the actual cutting conditions required of the tools.

Variable Factors: Certain variable factors are involved in each test: (a) The machine tool—its type, size, condition; (b) material cut—its analysis, structure,

Fig. 1—Typical solid tool of highspeed steel ground for heavy turning steel of about 250 to 300 brinell

Fig. 2—Typical tool holder with 30-degree left-bent shank and 15-degree tool holder angle. A right-cut tool bit ⅝-in. square of high speed steel for turning soft steel is shown



TOOL DESIGNATION – 8, 14, 6, 6, 20, 15, 1/8
Back Rake
Side Rake
End Relief
Side Relief
End Cutting Edge
Side Cutting Edge
Nose Radius
①

TOOL DESIGNATION – 8, 22, 6, 6, 6, 15, 3/64
Back Rake
Side Rake
End Relief
Side Relief
End Cutting Edge
Side Cutting Edge
Nose Radius
②

Welded Design Cuts Machine's Cost 60%

BY H. H. STAHL, DISTRICT MANAGER AND WELDING ENGINEER, THE LINCOLN ELECTRIC CO., BOSTON, MASS.

A striking example of a present-day trend in machine design is the evolution of a strawboard shear machine made by Hobbs Manufacturing Co., Boston, Mass.

Redesign of this machine for fabrication by electric arc welding resulted in a machine with a weight of only one-third that of the original and costing 60% less to produce.

In the former design (see Fig. 1), the various parts of the shear were made in individual pieces and had to be hand-fitted, drilled and bolted. All of these operations were eliminated by the welded design (see Fig. 2), which utilizes rolled steel in standard angles and plate sizes.

THE DESIGN PROBLEM

In changing over the design to welded steel construction, the manufacturer analyzed the load requirements of the frame which consists essentially of four legs acting as columns and braces acting as beams. Resistance to deflection was the main consideration.

FIG. 1—OLD DESIGN. *This shear was made in individual pieces that had to be hand-fitted, drilled and bolted. Line production system was impossible.*

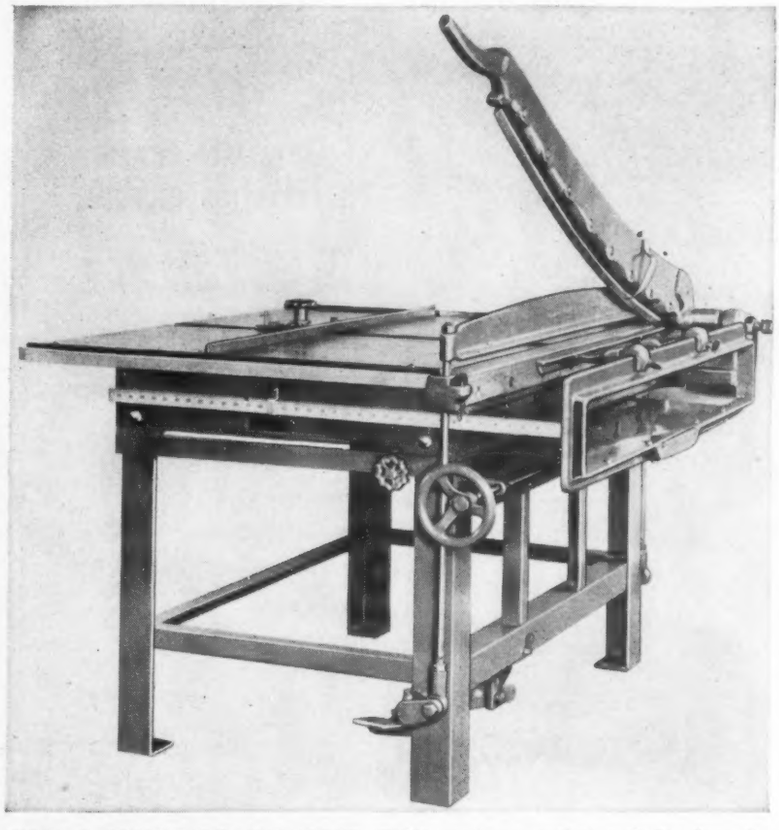


FIG. 2—WELDED DESIGN. *Hobbs engineers redesigned the shear for fabrication by arc welding. The new machine costs 60% less, weighs two-thirds less and is made by line production methods.*

For example, in studying the problem in light of the usual beam formula (see Page 496, 8th Edition, Lincoln Procedure Handbook), comparison can be made of the size of steel angles needed to replace the old material.

In simple designs such as this, however, the common sense formula, based on experience, should prevail. Sizes of members should be governed also by uncalculable demands of handling and shipment, when the machine often gets its roughest treatment.

PRODUCTION PROCEDURE

The simple angle iron and plate design of the frame (see Fig. 2) permits a standardized line production. Angles and plate are shear cut to size, are fitted up in a simple welded fixture and tack welded. All joints are fillets or square butts, requiring no bevelling. Tacked assembly is then placed in a positioner and finish welded . . . all joints downhand for maximum speed. A little grinding off of corner welds of top table and drilling for attachments is all the machining that's required.

A series of Studies in Machine Design are published by The Lincoln Electric Company and are available without charge to engineers and designers. They may be obtained by writing THE LINCOLN ELECTRIC COMPANY, Dept. 152, Cleveland 1, Ohio.

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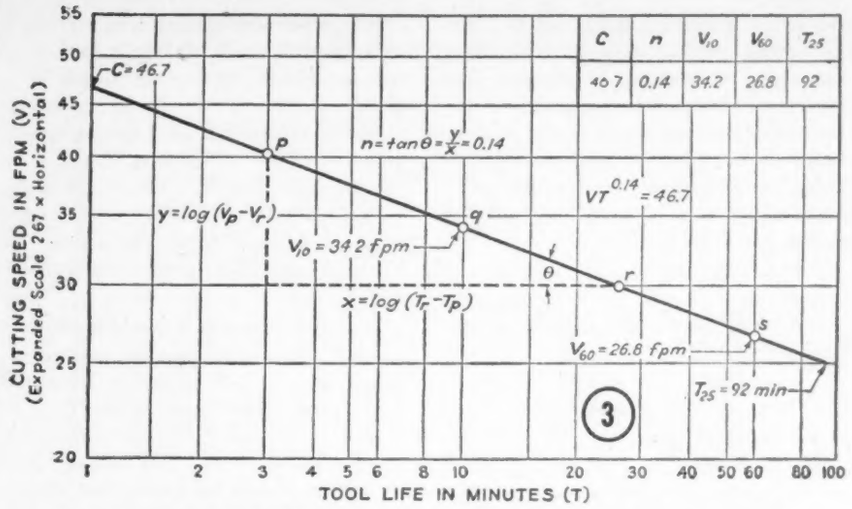


(Cuts in annealed SAE 2340 steel were dry at 0.200 in. depth and 0.050 in. feed with high-speed-steel tools of the 8, 22, 6, 6, 6, 15, 3/64 shape. The log-log scale has a vertical scale 2.67 times the horizontal.)

Fig. 3—Cutting-speed tool life line for turning with single-point tools, as determined from experimental tests as at p, q, r, and s

hardness, strength, size, and rigidity; (c) tools—material, treatment, and shape; (d) cutting fluid—class, properties, method of manufacture, and application; (e) size of cut (depth of cut and feed) and its shape.

Each of these variable factors is discussed below to indicate what information is intended in order to compare the test data with data obtained elsewhere.

Single-Point Tools: Single-point tools may be of a solid, bit, or tipped type. Solid tools, Fig. 1, are those in which the point of the tool is of the full shank section and consists entirely of metal-cutting material. Tipped tools are those in which a relatively small piece of metal-cutting material is attached to the tool point to form the cutting edges and face. Bit tools have relatively small pieces of tool material, or small tool shank material tipped with cutting tool material, clamped to a shank or tool holder, Fig. 2.

In compiling the test data, the cutting tools shall be specified as solid or tipped. If tipped, the method of attachment and the material of the shank should be given. All materials are to be described fully. The supporting surface quality and area, the fit of tool to holder, and method of clamping should be described. The clamping method, whether single-point bearing or a setscrew on a pad, should be specified. The amount of overhang should be limited to the width of the tool bit.

The shape of the tool point must be specified. Tool angles and data such as back rake, side rake, end relief, side relief, end-cutting-edge angle, side-cutting-edge angle, nose radius, setting angle, chip-breaker groove or shelf, grinding wheel used, and type of machine, together with lapping or honing practice, should be given in detail. It is suggested that the tool point nose have a 1/32-in. flat at a 45-degree chamfer, a radius of at least 1/32-in., or a sharp point. In any event, the radius should be measured and recorded as this is an important factor influencing tool life. The cutting edge should be placed on the center line of the work.

A convenient key as to tool shape of the bit type shown in Fig. 2 is as follows: 8, 22, 6, 6, 6, 15, 3/64. This means that the tool has 8-degree back rake, 22-degree side rake, 6-degree end relief, 6-degree side relief, 6-degree end-cutting-edge angle, 15-degree side-cutting-edge angle, and 3/64-in. nose radius. The setting angle is 90 degrees when the axis of the tool shank is at right angles to the axis of the work. The tool holder angle should be specified. The nomenclature of a solid-type tool for heavy cuts is shown in Fig. 1

Machine Tool: Under "machine tool" should be listed information as to:

(a) Type
  (1) Engine lathe, turret lathe, etc.
  (2) Manufacturer, model, and age.
(b) Condition—type of bearings for spindle mounting, runout, and state of repair.
(c) Capacity or size—swing over the ways, distance between centers, bar-stock size, maximum length to be turned.
(d) Method of power transmission—belt drive to step-cone pulley, belt drive to constant-speed pulley, geared head, direct motor drive, etc.; size and type of motor.
(e) Speeds available—in spindle revolutions per minute.
(f) Feeds available—in inches per revolution.
(g) Tool mounting and work-holding means—types of support, method of holding the tool and setting its nose on center.

Material Cut: For the material cut, information should be given as to:

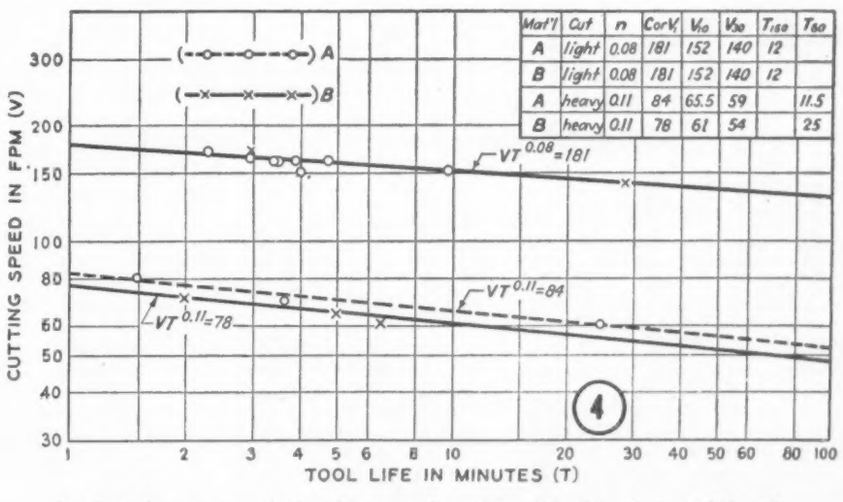
(1) AISI, SAE, WD, NE, etc., types or chemical analysis and an indication of whether the workpiece is a laboratory specimen or a production part.
(2) Thermal treatment (normalized, annealed, quenched, and tempered).
(3) Scale or surface condition
  As-forged, as-cast, or as-rolled (cleaned, pickled, blasted, hot-rolled, or cold-drawn).
(4) Physical condition
  Grain size and structure—microstructure.
(5) Physical properties

Tensile strength	Reduction of area
Yield point	Elongation
Impact	Work-hardening capacity
Hardness	

(6) Shape and rigidity, continuous or intermittent cutting.

If test logs are used instead of commercial work, then the size of the test piece must be adequate to assure rigidity and avoid chatter.

Size of Cut: It is known that tools


Mat'l | Cut | n | Cor V | V_{10} | V_{60} | T_{150} | T_{60}
A | light | 0.08 | 181 | 152 | 140 | 12 |
B | light | 0.08 | 181 | 152 | 140 | 12 |
A | heavy | 0.11 | 84 | 65.5 | 59 | | 11.5
B | heavy | 0.11 | 78 | 61 | 54 | | 25
A
B
$VT^{0.08}=181$
$VT^{0.11}=84$
$VT^{0.11}=78$
4
CUTTING SPEED IN FPM (V)
TOOL LIFE IN MINUTES (T)

(Both steels were quenched and tempered to give a Brinell hardness of 363. The tools of high-speed steel are described in the text. Two cuts were made dry—a light one with a feed of 0.0127 in. and a depth of cut of 0.0125 in., and a heavy one with a feed of 0.0127 in. and a depth of cut of 0.100 in.)

Fig. 4—Tool-life cutting-speed relationship in turning two forging die steels known as A and B

compared when taking light cuts are not necessarily arranged in the same order of merit as when taking heavy cut. These cutting conditions must be varied then as follows:

(a) Light, intermediate, or heavy cuts on materials which give discontinuous chips such as cast iron
(b) Light, intermediate, or heavy cuts on materials which give continuous chips such as steel
(c) Size and shape of cuts, tools, and cutting fluids, and materials for general purpose work
(d) Cuts, tool materials, cutting fluids, and materials for a specific commercial job

Depths of cut and feed in inches per revolution suggested for light, intermediate, and heavy cuts are: (1) Light cuts, 0.010-in. depth by 0.002-in. feed, (2) medium light cuts, 0.100-in. depth by 0.0125-in. feed, (3) medium light cuts, ⅛-in. depth by 0.020-in. feed, (4) medium light cuts, 3/16-in. depth by 0.010-in. feed, (5) heavy cuts, ¼-in. depth by 0.030-in. to 0.05-in. feed.

Test for Cutting-Speed Tool-Life Relationship: In a test to evaluate tools, materials, or cutting fluids based on the relation between cutting speed and tool life, there should be but one variable, namely, the material, the tools, or the cutting fluid. If it is the tool material that is under consideration, then the material cut and the cutting fluid should be kept constant, together with the shape of the tool and size and shape of cut. For each class of material machined there is naturally a tool form best suited for the purpose.

For the tool material tests, for example, the following should be kept constant: (1) Tool shape, (2) depth of cut and feed in inches, (3) setting angle of the tool, (4) analysis and heat-treatment of the material being machined, (5) type of cutting fluid used; dry cutting is included as a cutting fluid.

There must be a number of specific tests outlined, so that that particular test which most nearly reproduces the commercial conditions under which the tools are to be used may be selected. The cutting speed should be measured on the uncut work surface ahead of the tool. It should be recorded in feed per minute. There are two general methods now in common use for obtaining machinability ratings based on tool life:

(1) Obtain the tool life when cutting under standardized conditions at a constant cutting speed, as in turning cylindrical test bars.

(2) Obtain the tool life when cutting at a uniformly increasing cutting speed, as in facing.

In the facing tests, the cutting speed usually increases uniformly as the cut proceeds from the center of the work. The tool usually fails by virtue of very high temperatures caused by the constantly increasing speed. There is as yet no satisfactory relationship between the tests based on facing with increasing speed and those in turning with uniform speed.

How to Find Tool Life in Facing Tests Based on Increasing Speed: For the first type, the tool life for total failure for each of four to eight tools of a type or shape is to be obtained for several different cutting speeds, in accordance with the following procedure: The formula expressing the relation between cutting speed and tool life between grindings for a given tool, material, cutting fluid, feed, and depth of cut is

$$VT^n = C$$

where V = the cutting speed in feet per minute.

T = the tool life or duration of cut between grindings in minutes

C = a constant depending on the specific conditions, and equals the cutting speed for a tool life of 1 min

n = the slope of straight line that appears on the log-log paper.

If four or more turning tests were run on a metal in which all factors were kept constant except the cutting speed V, a definite value of tool life at failure T would be obtained at each cutting speed, as indicated by points p, q, r, and s on the curve in Fig. 3. These and more points plotted on Cartesian co-ordinates would indicate a hyperbolic curve. On log-log paper they produce a straight line[1].

In Fig. 3, y as scaled should be divided by 2.67, as in this case the vertical ordinate scale is 2.67 times the horizontal to exaggerate the slope. When T = 1, then C = V_1 (46.7 feet per minute for a 1-min tool life). V_{10} (the cutting speed in feet per minute for 10-min tool life) as read from the curve is 34.2, V_{60} is 26.8, whereas T_{25}, the tool life for the cutting speed of 25 feet per minute, is 92 minutes. These values, or similar ones needed to compare this curve with another, are summarized in Fig. 3.

Tool Failure: Single-point tools in continuous cutting may fail by: (a) Abrasion or wear on the flank below the cutting edge, (b) wearing a cup in the tool face back of the cutting edge which becomes steadily larger and finally causes the cutting edge to crumble, (c) combined flange and face wear.

Sometimes before the complete breakdown of the tool or ultimate failure, there is what is called a preliminary failure. By preliminary failure is meant the failure of a small portion of the cutting edge. This may occur on the end of the tool, such as on the nose radius, and change the quality of the machined surface. To avoid preliminary failure, either the nose radius may be reduced, the side cutting edge angle increased, or the shape of cut changed. In this way it is possible to prevent the failure from changing the quality of the machined surface and have it

(*Please turn to Page* 162)

SUGGESTED DATA SHEET FOR CUTTING-SPEED TOOL LIFE TESTS IN TURNING
(These data are plotted in Fig. 4 to form the two highest lines)

Tools: ⅜ in. square × 3 in. long, high-speed steel (RCS)
Material cut: Die steels A and B forged log 6 in. diameter × 20 in. long, 363 Brinell
Depth of cut: 0.0125 in. Feed: 0.0127 in. per revolution
Tool angles: Date: 6/4/38

Back rake angle, deg	8
Side rake angle, deg	14
End relief angle, deg	6
Side relief angle, deg	6
End cutting edge angle, deg	6
Side cutting edge angle	15
Nose radius	3/64 in.
Setting angle	90 deg
Back slope of bit in holder	10½ deg

Observer's name: .....
Tool support: Special solid tool holder 1½ inches × 2½ inches × 4 inches
Cutting fluid: Dry
Room temperature: 75 F

Test Number	Tool Number and Rockwell C*	Work Diameter at Cut	Log Sect†	Cutting Speed, fpm	Tool Life, in Min	Cutting Fluid, Temperature	Remarks Nature of Tool Failure and Types of Chips	
5	44T-64	5.650	4	164.8	2.94	.....	Typical cup failure	Die Steel A
6	67T-64	5.650	3, 2	163.8	3.90	.....	Typical cup failure	
57	80B-63.5	5.275	3	161.6	4.77	.....	Typical cup failure	
59	45B-64	5.225	3	151.5	9.87	.....	Typical cup failure	
34	78B-64	5.030	4, 3, 2	161.6	4.08	.....	Typical cup failure	Die Steel B
35	75T-64	5.03–5.000	4, 3, 2	141.4	28.27	.....	Typical cup failure	
37	64T-64	4.905	4, 3, 2, 4	151.5	10.16	.....	Typical cup failure	

* Tools ground on both ends, one end T, other B.
† 20-in. log divided into four sections of 5 in. each, numbered 1 to 4 from chuck.

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Scrap Salvaging

In a small plant operations are based on kind of scrap generated, bulk and weight, and on demand for different grades of scrap material

BASIC principles governing the handling of scrap are essentially the same whether the manufacturing organization is large or small. Assuming that the shop operations are relatively the same, the major difference is in the volume. In planning a setup for either a small or a large shop, proper consideration must be given to the kind of scrap generated, the bulk and weight of the material to be disposed of, and the demand for the different grades of scrap material. This latter point is very closely related to the volume because the amount of the different grades of scrap created will determine to what extent the segregation is to be carried out.

Generally speaking, large salvage operations are carried on with a fair degree of efficiency and with sizable profits over operating expenses. Operating a small salvage setup with any comparable efficiency is a little more difficult, for in a small shop space is usually at a premium. Efficiency in smaller operations can be attained, however, by fitting the salvage activities to local requirements according to the principles expressed above. In comparison to many plants of Westinghouse Electric Corp., the Baltimore Works is a relatively small manufacturing organization, therefore its salvage operations are a good example of what can be done in a small plant. The scrap shed is a lean-to affair constructed of corrugated sheet metal and is attached to the end of one of the main buildings. A row of bins, with identification cards attached to each bin is shown. Storage bins, Fig. 1, consist of two tubs welded together, with the bottom tub welded to a skid. A sheet metal bottom is seam welded into the bottom of each tub to prevent oil from draining onto the floor. Each bin is provided with a capped drain pipe which can be used for draining off surplus oil. The top of each bin is equipped with "ears" to which chain hooks from the two-ton electric crane can be attached.

A mono-rail system extends down both sides of the shed. At the far end of the building a large door opens out on a drive-way. This entrance is so arranged that trucks can back in to a point where the bins can be dumped directly in the truck from any location in the shed. Platform type weighing scales are also located on this end and are used to weigh the bins before they are dumped into the truck. Handling is kept to a minimum.

Scrap bins located on the machine shop floor are constructed to provide adequate container service as well as ease in handling. When the bins are full, an electric truck picks them up and transports them to the scrap shed. Another important feature of this setup is the fact that the major part of the material segregating operation is conducted in the area where the scrap is generated. This is what is called "on spot" segregation. For a small operation, this is said to be most economical because it is a part-time job and can be performed by an operator in the machine shop area.

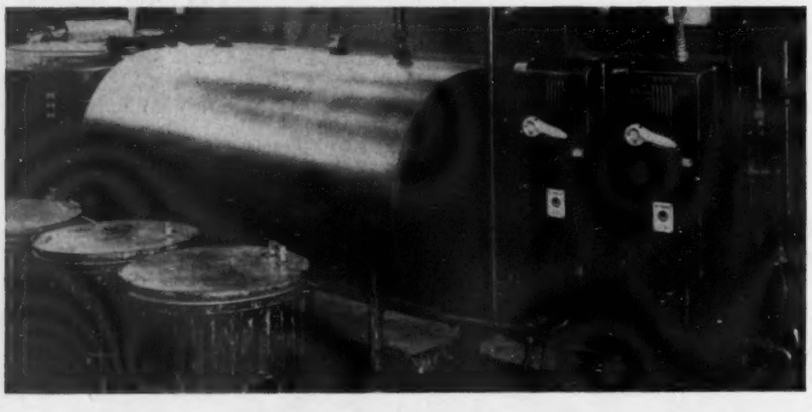
An oil extractor illustrated in Fig. 2 is located in the machine shop area. The purchase of this equipment was a result of a study made of the consumption of cutting oils. The study revealed that the shop was using around 9,000 gal of cutting oil per year, at a total cost of approximately $3000. The major part of this oil was going out in chips and turnings.

Prior to the purchase of this equipment, no attempt was made to salvage any oil adhering to metal turnings. This resulted in a double loss because use of the oil was first lost in the turnings; and secondly the company lost money on some of the chips and turnings because buyers would not pay full price for oil-contaminated scrap.

The oil extractor averages approximately 75 per cent recovery of oil in chips and turnings from operations. With this figure, indicated savings amount to about $2250 per year. As in the case of the scrap bins located in this area, a machine shop man takes care of this operation.

Fig. 1 (above)—Scrap storage bins consist of two tubs welded together, with the bottom tub welded to a skid

Fig. 2 (below)—Oil extractor averages approximately 75 per cent recovery of cutting oil in chips and turnings. Indicated savings amount to about $2250 per year



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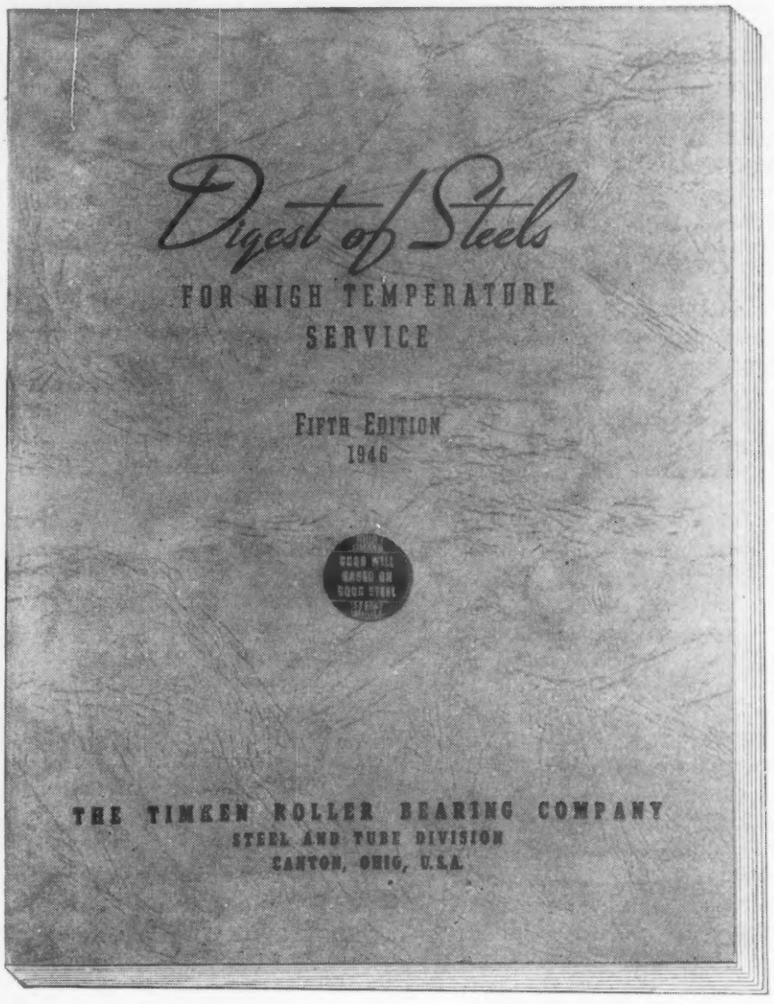

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Engineering News *at a Glance*

MIRROR FINISH FOR ALUMINUM: Aluminum surfaces free of scratches, roll or draw marks, spinning lines and other surface marks may be provided with a bright chrome-like finish by employing a process developed recently by Colonial Alloys Co., Philadelphia. Surfaces of aluminum or aluminum alloys with these imperfections may be made highly reflective except that the imperfections are not entirely removed. Besides the mirror-like surface, the company reports, the treatment passivates the surfaces to render them more resistant to tarnish and corrosion. It also benefits recessed or difficult-to-reach areas untouchable by wheel buffing and polishing. While large surfaces may be treated, small objects such as screws, nuts, bolts, fittings, tubing or extruded parts lend themselves to greater production.

BLOWPIPE "SLICING:" All kinds of shapes in stainless steel may be cut at amazing speed by means of a process, called powder-cutting, developed by The Linde Air Products Co., New York. The process is reported to bring to stainless steel all the advantages of oxygen-cutting carbon steels. Cutting is done at a fast pace by a mechanized blowpipe from which is ejected a stream of oxygen and an oxyacetylene flame as well as a special finely-divided powder. According to Linde, the development represents a valuable tool for metalworkers, one that shortcuts many slow machining operations.

FELT STANDARD REVISED: Implying expanded use of wool felt in industry, the felt standard of the Society of Automotive Engineers is being amended commensurate with postwar commercial practice, as recently coded by makers of the material, according to the Felt Association. Minor changes are being made in weights and thicknesses. Four thicknesses of ball bearing felts replace the eight formerly specified, while the eight former thicknesses of lining felts are being replaced by two. Specifications are now consolidated in one table instead of five, and conform in arrangement with standard government specifications.

SO IS COAL: Scrap is important because open-hearth steel normally is made by melting pig iron and scrap. It could be made 100 per cent from pig iron or 100 per cent scrap and still be top quality steel. But every ton of steel scrap takes the place of 1 ton of pig iron; and to make 1 ton of pig iron requires 2 tons of ore, 1.2 tons of coal converted to about ¾-ton of coke and ½-ton of limestone. Thus to make 90,000,000 tons of steel without scrap would require 150,000,000 tons of ore, 108,000,000 tons of coal and 45,000,000 tons of limestone. There are simply not enough mining, plant and shipping facilities to handle all this tonnage. National Auto Wreckers Association, estimates the industry, in 1941, used 42,000,000 tons of scrap in making about 83,000,000 tons of steel.

SELECTS FOOTCANDLES: To help create a better understanding and appreciation of quantity and quality of lighting with ease and comfort of seeing, General Electric's lamp department at Nela Park, Cleveland, recently devised a vest-pocket footcandle selector that indicates lighting recommendations for more than 75 "seeing" tasks. It lists a variety of lighting applications including those in homes and industry, selecting them simply by a movement of a tiny lever. Selector recommendations are based on more than 30 years of lighting research by the lamp department.

"PANCAKE" MOTOR: Noted among patents available for licensing or sale at the Patent Office, Washington, is a pancake-shaped, universal type electric motor which operates on 110 v. According to the inventor, E. C. Jones of Kansas City, Mo., the motor is noiseless developing a speed of 400 rpm. Its shape makes it applicable to refrigerators and other appliances where storage space is a factor. Listed as patent No. 1,996,023, the motor may be operated for long periods without attention. A feed wick carries oil from a well to the shaft making the motor self-lubricating. It also is reported to use little current, is easy to repair and is self-starting.

MEASURES AS IT "BREATHES": Gas or liquid pressure is converted to electrical energy for measuring, recording or controlling by means of a pressure-sensitive device developed recently by Baldwin Locomotive Works' Southwark Division, Philadelphia. Its extreme accuracy, one-fourth of 1 per cent of full scale, means the device may be used for control operations formerly not possible. It is being made in several ranges up to 0 to 20,000 lb psi. Heart of the device, essentially an electronic unit, is a very fine wire filament wire-bonded to a hollow metal core against which is exerted the gas or liquid pressure. As pressure increases, filament stretches, changing the diameter of the wire and causing measurable changes in the electrical resistance of the wire. Change in resistance varies amount of current flowing through the filament circuit and, when amplified, the changes show up on the dial or are used to actuate a control system. Filament is sensitive to a "stretch" of the metal core of only one-millionth of an inch. This ability to measure great changes in pressure without any physical movement led to a description of the instrument as being actuated by the "breathing" condition of the metal. The SR-4 device, as it is called, is about 1 in. in diameter and 5½-in. long.

HAIRLINE ACCURACY: Such close tolerances are required on modern motion picture projectors that highly-rated manufacturers of accurate instruments often refused to guarantee that the tolerances indicated on projector blueprints would be met. Hairline accuracy for the countless small parts necessitated a heat treatment to very close tolerances. Thus International Projector Corp. of Bloomfield, N. J., was forced to devise machinery and techniques to the job. An interesting example of the precision work required in the manufacture of a projector, according to "Metal Minutes," is the star wheel that provides movement of the compact mechanism. This critical part is held to one five-thousandths of an inch after heat treating for grinding.

DUST TO COMPOUND: Bacteria, normally in the air between sweepings, is reduced by 97 per cent by a brush now manufactured by Milwaukee Dustless Brush Co., Milwaukee. The dustless "broom" is designed with a reservoir in its back to hold a sweeping fluid. Center row of its tufts is connected with the reservoir. During the sweeping process, the fluid feeds through the tufts and moistens every particle of dust it contacts. Instead of rising in the air, the dust itself is converted into a sweeping compound said to be more effective than sawdust and many other sweeping aids.

"ARMOR" FOR "TIN FISH:" Much useful information was accumulated from the construction and development of military equipment. For example, during the war, electric torpedoes became the business of Westinghouse transformer engineers. One of their big "headaches"

was the protection of the thin steel shell of the torpedo body from the simultaneous action of sulphuric acid on the inside and salt water on the outside. Insulation against these corrosion agents came, surprisingly enough, from a highly specialized electrical varnish—the same type used in transformers. The steel torpedo shell was Parkerized first, then given a single dip in the varnish and baked. Result was a baked synthetic-varnish surface that was remarkably abrasion-resistant, considering the rough handling to which the missile is subjected. Ultra protection of the "armor" coat was indicated when a torpedo was fished out of the sea after 9 months immersion, and found to be in perfect condition.

FROM MISSOURI?: To prove performance of its odorless, noninflammable plastic rack coating, Peninsular Chemical Products Co., Van Dyke, Mich., is requesting platers to forward a sample rack for a free trial treatment, returning each rack for testing in the user's plant. The new coating consists of an aqueous dispersion of Saran plastic and contains no organic solvents. According to the company, the material is tough, flexible and highly resistant to all plating and cleaning solutions, including chlorinated degreasing solvents. It is applied by hand dipping and dries in less than an hour at room temperature, giving complete protection in 24 hours. It also is free flowing, draining rapidly without forming webs or strands to be trimmed off after dipping.

PORTABLE "HOT" FLAME: Hot flame for such work as straightening, bending, shrinking and expanding, skin drying foundry molds, and for general work in boiler and railroad shops is produced by a portable "packaged" machine currently coming off Aeroil Products Co.'s production lines, in West New York, N. J. Any length or type of flame can be produced by the "burner"—6 in. to 15 ft long—from a lazy little flame to a long hot one of 2000° F. No special fuel is required by the machine; it operates on kerosene or any oil up to No. 3 fuel oil. The unit's two burners make it possible to work in a vertical as well as horizontal position without affecting volume or density of the flame.

STEAM FOR UNCLE SAM: General supposition is that the proper fulfillment of a locomotive's destiny is hauling trains over a railroad. Unexpected circumstances, however, do arise. Late last year during the Pittsburgh power strike, such an instance occurred when a Baldwin-built Pennsylvania Railroad steam freight locomotive was called into service as a temporary heating plant. The city's huge Federal building, which houses the main postoffice, federal courts and scores of government offices, was the scene of operation. Engine No. 7103, built by Baldwin Locomotive back in 1915, was hauled to the edge of the building on one of the four tracks used for handling mail direct from mail cars to the postoffice. Two hundred pounds of steam were built up, and the outlet from the engine was connected into the steam line of the building. It is reported the steam furnished by the locomotive was sufficient, in spite of the building's 2800 radiators, to bring the building to a comfortable temperature.

ACCORDION CONVEYOR "CLICKS:" More proof that manufacturers are greatly interested in flexible methods of handling materials is furnished by Food Machinery Corp. Last year, its Riverside, Calif., division introduced nationally a portable gravity roller conveyor, so flexible it extends from 35 to 100 in. per unit, is easily set up and is capable of being formed quickly into practically any shape. Users found the accordion feature saved time, space, ended aisle jamming and generally reduced overall costs. Sudden interest in the development even surprised the corporation which had tooled up for a comparatively modest volume. To meet the demand, the company recently expanded its facilities and is now making immediate delivery of all sizes. Example of the conveyor's flexibility is that users, in moving sections of the unit about, merely fold up the conveyor, turn it over and use its rollers as wheels.

SCANS FOR FLAWS: Flaws at inaccessible parts of ferromagnetic tubes and pipe may be found and measured with a simple alternating current inductance bridge according to a report held by the Office of Technical Services, Washington. Both bore and exterior surface weaknesses can be located by this method. According to the report, the inductance bridge is coupled to an indicator through an amplifier. One inductance coil is used as a pick-up or detecting coil and the other as an identical compensating coil. The coils are wound on iron cores and are equipped with magnetic shunts of a high permeability nickel-iron alloy. Metal tested is magnetized with a very weak direct current. Flaws located by scanning surface of the metal with the pick-up coil, upset the balance of the bridge and cause the indicator to twitch rapidly. Extent of flaws may be determined by thorough scanning in the defective area. The method was used in nondestructive testing of gun tubes at the Watertown Arsenal during the war.

FREE "LAB" SERVICE: Metallurgists and production men concerned with heat treating may obtain a direct comparison between physical characteristics resulting from salt bath heat treating and those resulting from other methods, without necessity of making large capital investment or obligating themselves or their companies in any way, in this modern metallurgical laboratory, completed recently by Ajax Electric Co. Inc., Philadelphia. Considered a model installation, the lab contains a battery of seven furnaces, with accompanying quench, acid pickling and rinse tanks, and a drying oven—all of commercial proportions—to permit treatment of virtually any normal size work by any process for which salt bath furnaces are used. No charge is made for treating specimens submitted by any bona fide production executive or metallurgist

High Temperature Furnace

(*Continued from Page 99*)

socket joints (for which patents are being taken out) are sufficiently gas tight for practical purposes, additional insurance is given by a luting which has been developed and which becomes plastic at the operating temperature of the furnace, thus lubricating and sealing the joints at all operating temperatures.

Special ring type luminous flame burners had to be developed for firing these tubes at subatmospheric pressures so that if any leaks were to occur, this leakage would be inward to the tube and not from the tube combustion space into the furnace, thus precluding atmosphere contamination and subsequent harm to the charge being treated.

Flame length can be controlled by the designer to give even heating the entire length of the tube and tests have shown that in a furnace 22 ft long, temperatures throughout can be held to a plus or minus of 10° F, thus insuring even heating of the charge.

Overall gas efficiencies are astonishingly high because of the type of flame developed and the material of which the tube is made. Silicon carbide has a black body co-effcient of from 0.90 to 0.95 at all temperatures, which is exceptional. There is no tendency for a heavy insulating layer of oxidized material to form on either the inner or outer surface of the tube no matter how high temperatures are driven, which would inhibit the absorption, conduction and emissivity of the heat.

Silicon carbide tubes have been found to be such an excellent media for the transfer of the radiant heat of the enclosed gas flame that the heat transfer can be explained only on the basis that the material possesses an extremely high heat conductivity. Also the silicon carbide apparently aids the combustion. Thus in a 4 in. ID tube at a temperature of 2200° F natural gas can be burned at the rate of 175 cfh with an Orsat analysis of carbon dioxide, 11.6 to 11.5 per cent; oxygen, 0.0 to 0.5; and carbon monoxide, nil. While this high rate of fuel consumption and consequent high rate of heat transfer may be due in part to the special type of burner which has been employed nevertheless the effect of the burner will not explain why the same tube and burner, at lower temperatures (1500 to 1800° F) and with the same Orsat analysis, will burn gas at the same pressure at the rate of 220 cfh. Normally one would expect that the rate of gas consumption would fall off at the lower temperatures. Whatever the explanation for this phenomenon may be, the ability of the silicon carbide burner tubes to handle larger quantities of gas when cold has been most useful in bringing furnaces up to operating temperatures relatively quickly.

Exceptionally long life for the tubes is indicated because the tubes which have been used experimentally for over two years show no signs of deterioration after intermittent firing up to 2650° F. Testing these tubes to destruction is not possible because of the inability of gas flame temperatures to reach the necessary heights. The only service which is in any way analogous is the use of Carbofrax tubes in Fitch recuperators in which service, with higher heat differentials, the life is from five to ten years. Therefore, this life expectancy at such temperatures will open fields for the consumption of gas which has not been enjoyed before.

This will give the gas industry entrance to the fields of copper brazing, bright forging, sintering of powdered metals, heat treatment of permanent magnet metals, high temperature anneal of high silicon electric steel, malleablizing and many other of the already known applications.

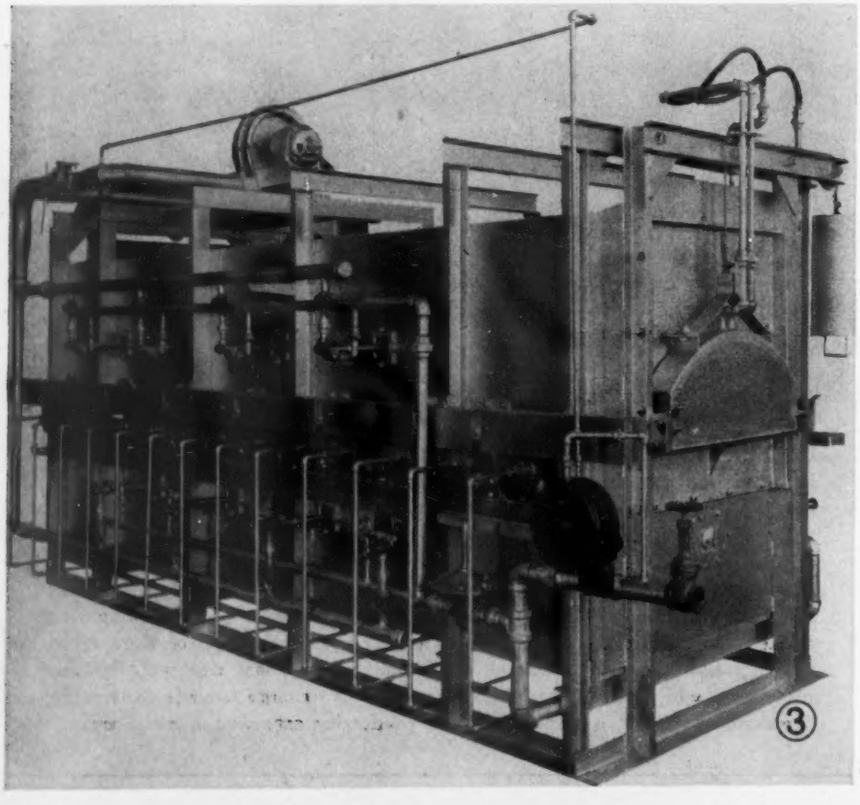
Tube Burners in Roller Furnaces

An example of the expanding field for silicon carbide radiant tube burners in roller furnaces, such burner tubes will be placed between silicon carbide rollers developed by the Gas Machinery Co. This is done in order that the radiant heat furnished by the tubes may be brought as closely as possible to the work, and also to heat the surface of the rollers so that the rollers may add heat to the work rather than rob the work of heat as is usually the case. While this practice would seem to invite excessive heat loss through the rolls, the resistance of such rolls to heat transfer renders the construction most desirable. This type of roller furnace can withstand high static loads.

The Gasmaco silicon carbide roller consists essentially of a tube of silicon carbide supported concentrically upon a hollow steel shaft by high-temperature insulating refractory. The size of the roller is engineered to load and temperature requirements. At the present time two general types of insulating refractories are used—one up to 2300° F and the other up to 2800° F. Insulating refractories for even higher temperatures for heavy loading are in the process of being developed and tested. The hollow steel shaft can be varied both as to size and alloy content to meet load requirements. Its full strength is retained at any furnace operating temperature by being water-cooled.

Silicon carbide has the property of increased strength of approximately 5 per cent at elevated temperatures, reaching a maximum strength at about 2500° F and not appreciably losing this strength after several hundred degrees increase of temperature. When suitably supported upon an insulating material in such a way as to eliminate the effects of thermal shock and reduce the heat loss to a mini-

Fig. 3—Roller hearth industrial furnace showing individual intake water lines



NUMBER 1 OF A SERIES OUTLINING McKEE SERVICES TO THE IRON AND STEEL INDUSTRY IN RECENT YEARS

NUMBER 1 OF A SERIES OUTLINING McKEE SERVICES TO THE IRON AND STEEL INDUSTRY IN RECENT YEARS

MCKEE history covers four decades of engineering and construction in every quarter of the globe. This map shows more than 650 locations in the United States where McKee has supplied design, engineering, construction or equipment for the Iron and Steel Industry and the Petroleum Refining Industry during the past 15 years.
KEY
■ Iron & Steel Plants ● Petroleum Refineries
15 15 Figure in symbol indicates number of contracts represented by that symbol
Arthur G. McKee & Company
★ Engineers and Contractors ★
2300 CHESTER AVENUE • CLEVELAND, OHIO
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.
McCORMICK BUILDING, CHICAGO, ILLINOIS
McKee activities include almost every country in the world where Petroleum products and Iron and Steel are produced. In recent years McKee has handled more than 250 contracts in the following countries:
Australia
Brazil
Canada
China
Czechoslovakia
England
France
Dutch East Indies
Dutch West Indies
India
Latvia
Mexico
New Zealand
Peru
Poland
Romania
South Africa
Sumatra
Russia
Trinidad
Turkey

mum, it has been found that the silicon carbide has an indicated service life commensurate with the service life silicon carbide has given for years in other furnace parts subject to excessive wear and heat.

Development of the silicon carbide rollers was begun some months ago in an experimental way and patent applications have been made. After thorough laboratory testing, rollers of this type were installed in a production furnace of a Cleveland steel plant. This furnace operates at 2100° F and is used to anneal stainless steel. At the end of the several months' service the rollers appeared to be in good condition.

Because of the surprisingly high hot load strength of the silicon carbide roller when made according to tested construction, the practice of moving the load forward and backward during the soaking period to prevent sagging of rollers can be eliminated with a saving of furnace space and operation difficulties.

The rollers are not subject to sagging and therefore can be operated either intermittently or continuously to suit the job. They provide a means of conveying material through furnaces or kilns at increased efficiency because there is no high sensible heat losses of carriers such as pallets, cars and saggers. The range of temperature, the speed of the material through the furnace and the hearth loads are extended beyond commonly accepted practice and the replacement and maintenance costs are minimized.

Issues Coal Directory

A directory presenting information about the coal and the mines which are located on the Chesapeake & Ohio railway has been published by the railroad. Contents include: Operating companies showing mine name and number; mines, listed alphabetically; geographical arrangement of mines, divided by producing districts and each with a map; sales agents; C & O coal loading statistics; and personnel of coal operators associations and the railroad's coal traffic department. Many photographs and a large 5-color map are included in the directory, available from the C & O's Cleveland office.

Test to Determine Thermal Conductivity

To provide more accurate and dependable values of thermal conductivity for most insulating materials on the market, the Committee on Research of American Society of Heating & Ventilating Engineers is instituting a program to be carried out by Technical Advisory Committee on insulation. Laboratories having acceptable equipment are being sent a sample of insulating material which, after testing, is sent to National Bureau of Standards for re-testing to determine basis of ability of laboratories to check with acceptable tolerances.

A list of acceptable laboratories will be made available to manufacturers of insulating materials and they will be urged to have their products checked.

Plastic Coated Drill Pipe

. . . prevents development of corrosion fatigue cracking

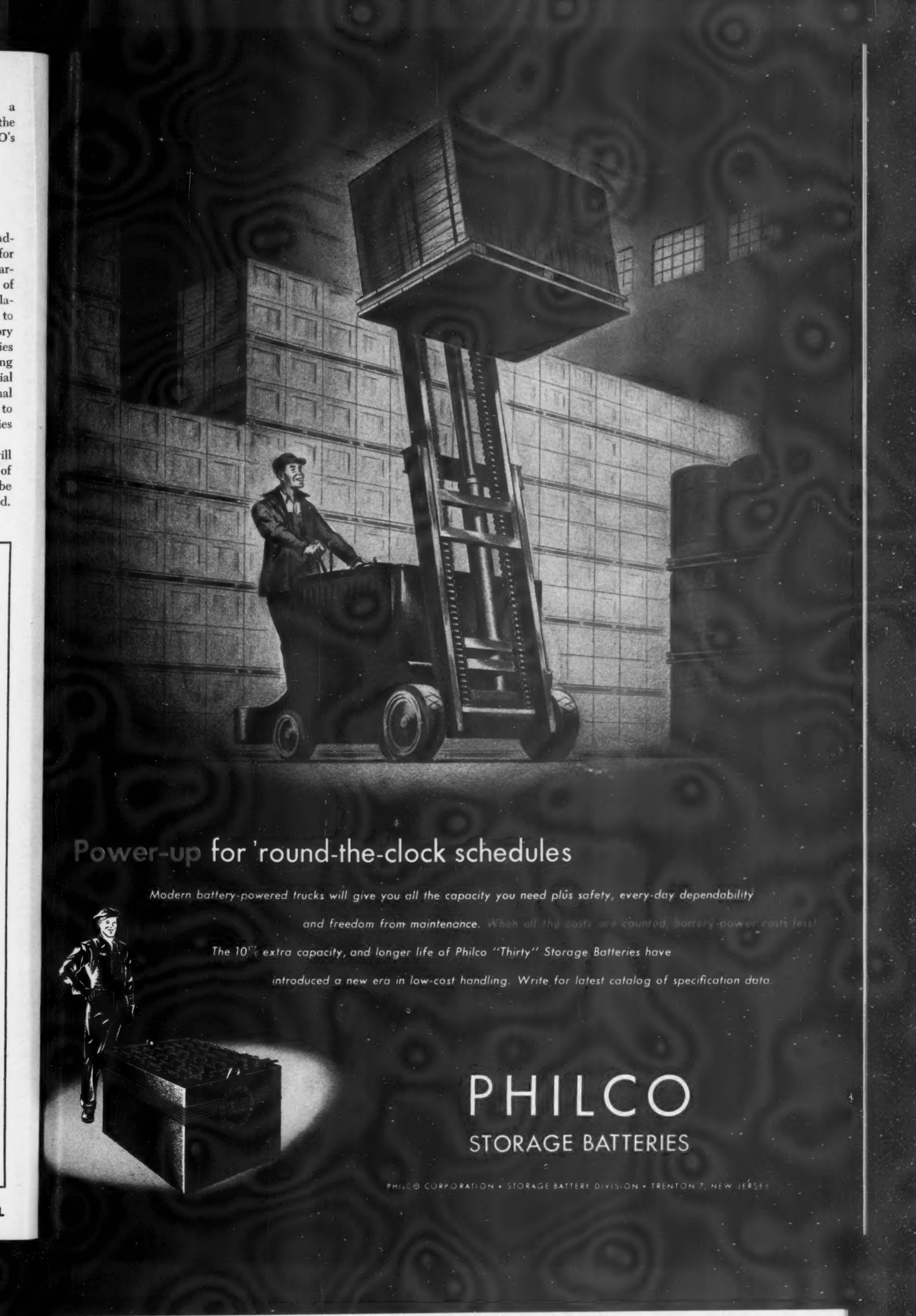
MANY pipe failures caused by corrosion pitting during oil well drilling are now being prevented by the use of a thermo-setting plastic coating, intermittently tested over the past few years.

According to Dr. L. E. Trishman, chief research engineer of Spang-Chalfant division, National Supply Co., Pittsburgh, corrosion pits or any other surface notches act as stress raisers in rotating or highly stressed machine parts. To prevent corrosion pitting a coating would have to be impervious to oil and water, resist comparatively mild chemical attack and remain chemically stable itself. It would have to withstand temperatures as high as 400° F, resist mild abrasion and not become brittle or flake off. Neither could it change the physical properties of the surface of the pipe. Through research and experiments started in 1940 a thermo-setting plastic was found to be the answer.

The new pipe is in production at Spang-Chalfant division's plant at Ambridge, Pa. Drill pipe, the majority of it 4½-in. in diameter first is shot-blasted on the inside. Pipe is then upended in a rack and the liquid plastic is forced up the inside of the pipe until it reaches the top. It is then drained slowly so that no air bells or streaks are formed. After a short drying period at normal temperature, the pipe is placed in an oven and the plastic coating baked on. Four successive coatings are baked on the pipe.

Only the inside of the pipe is coated for oil-well drilling because it has been found that almost all corrosion fatigue failures develop only from the inside. Pipe turning in the hole keeps its outside surface burnished by rubbing against the wall of the hole. For most other applications the pipe probably would need to be coated on both the inside and outside surfaces.

Half-sections of 4½-in. OD drill pipe showing, left, inside surface of pipe as it comes from the mill; right, inside coated with a baked-on plastic. Plastic coating protects pipe against corrosion while drilling wells in highly corrosive oil fields


Power-up for 'round-the-clock schedules
Modern battery-powered trucks will give you all the capacity you need plus safety, every-day dependability and freedom from maintenance. When all the costs are counted, battery-power costs less!
The 10% extra capacity, and longer life of Philco "Thirty" Storage Batteries have introduced a new era in low-cost handling. Write for latest catalog of specification data.
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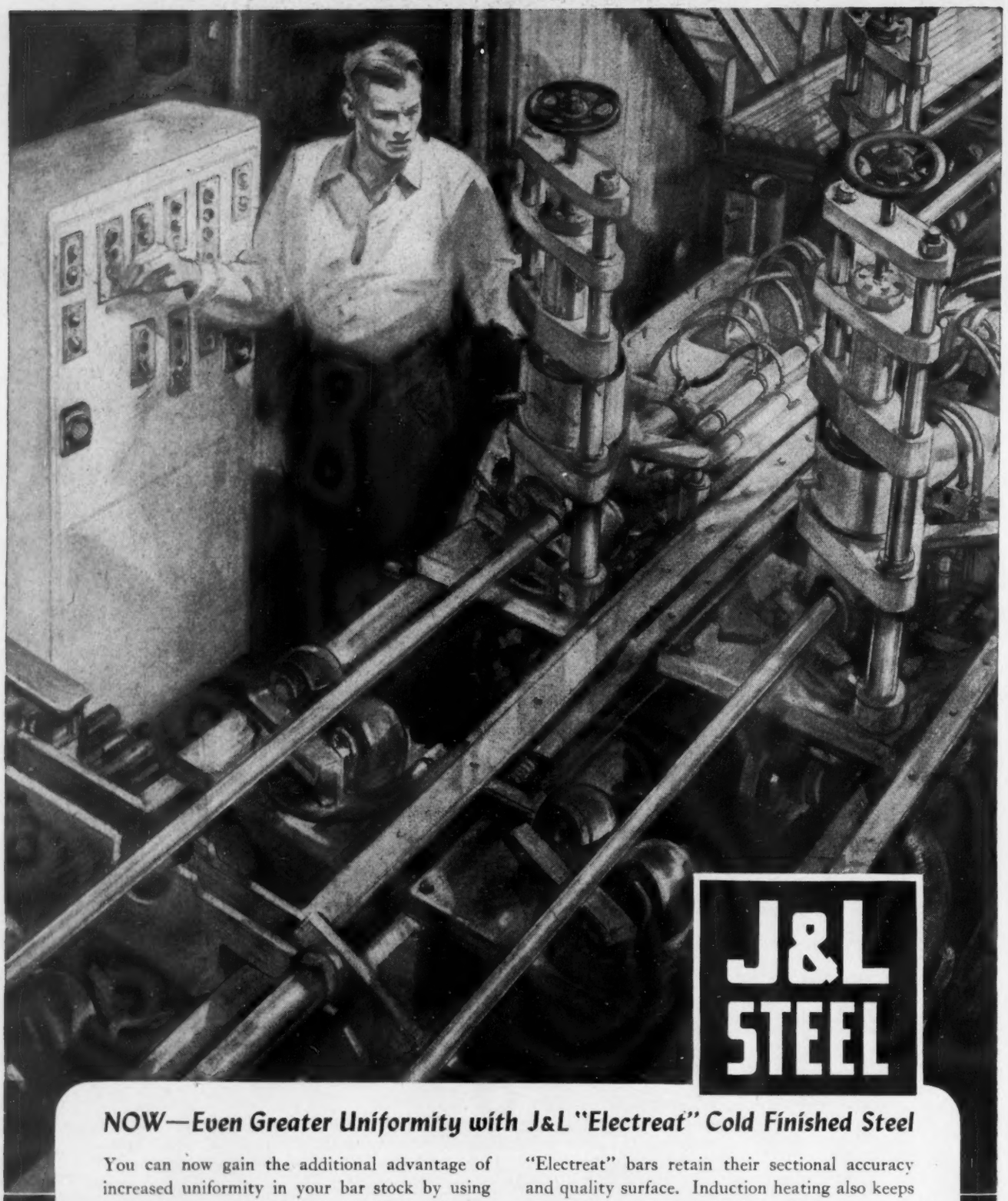


NOW—Even Greater Uniformity with J&L "Electreat" Cold Finished Steel

You can now gain the additional advantage of increased uniformity in your bar stock by using J&L "Electreat" Cold Finished steel. In this new electric induction heat treatment process each bar is heated and quenched individually in exactly the same length of time as other bars in the lot. This makes possible greater uniformity than is provided by conventionally heat treated bars. In addition, "Electreat" bars retain their sectional accuracy and quality surface. Induction heating also keeps to a minimum decarburization of the bar.

A variety of sizes of "Electreat" Cold Finished bars are available in a wide range of quenched and tempered treatments. Write to address below for full information on how "Electreat" bars can be applied in your operations.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

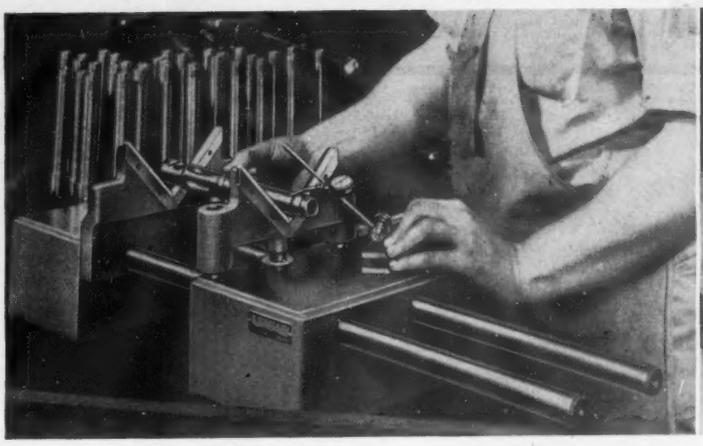


Fig. 1—Instrument is used by grinding machine operator to check concentricity during production

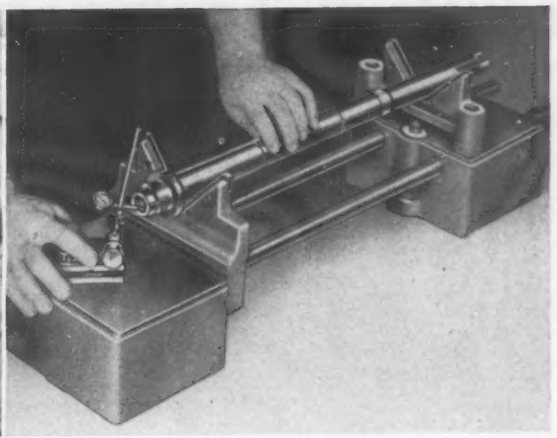
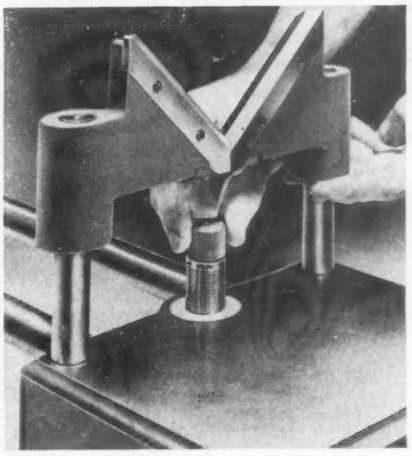


Fig. 2—Shaft of varying diameters is held in exact horizontal plane for checking concentricity of bores and outside diameters

Checking Concentricity OF ROUND PARTS

BY automatically determining the proper center line heights for any combination of diameters involved in a work piece, the V-Liner shown in the accompanying photographs is said to eliminate use of complicated measuring equipment and mathematical computations in checking relative concentricities on round parts or sections.

Developed by Swanson Tool & Machine Products Inc. of Erie, Pa., to simplify concentricity checking on a miscellaneous variety of close tolerance machine parts, the instrument consists of two V-blocks mounted on solid members held in correct alignment by cylindrical rods. The aligning rods are pressed into the first V-block member and permit the second member with elevating V-block to move as desired. By setting the adjusting screw to correspond to the diametrical difference between any diameter involved in piece to be checked, the device positions the part in horizontal plane for checking.



Concentricity of internal and external diameters and of shafts of varying bores and outside diameters can be determined. The fixture may be used in conjunction with machine tools to check parts in production as well as in finish machining and inspection.

Fig. 3—Establishing center line prior to introduction of work

New Cutting Oil, Drawing Compound Introduced

A universal cutting oil for cutting all types of steel, said to give increased cooling efficiency, and a drawing compound that prevents metal to metal contact between dies and work piece, are offered by J. W. Kelley Co., Cleveland.

The cutting oil, named Kelcotene No. 6, combines sulphur, chlorine and mineral oils to obtain the benefits of all three, the company states. It may be used on automatic screw machines, lathes, light broaching, drilling, gear cutting and threading on low carbon steel and annealed alloy steels or, by cutting back with paraffin oil or kerosene, on harder steels.

The drawing compound, Beacon No. 103, is nonpigmented and may be cut back to proper consistency with water. It can be applied with brush or by dipping. The company states that it also acts as a rust preventative.

Drive Mechanism Increases Stoker Life

By utilizing a new universal drive mechanism developed by Cone-Drive Division of Michigan Tool Co., Detroit, the Stoker Drive Co. of Frederick, Md., was able to reduce the basic cost of the drive as well as its number of parts. The drive makes it possible to increase stoker life, make the drive universally useable on different makes of stokers. The design lends itself to a line of stokers ranging in size from small household to large industrial models.

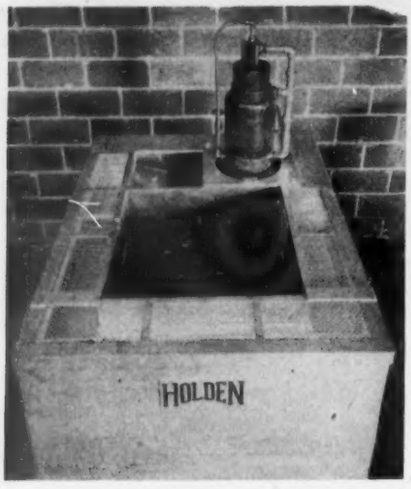
A major factor which had to be taken into consideration was the large gear reduction required in stoker drives between the motor shaft and the feed, i.e., 1750 to 2.2 rpm. Three drive sizes are being made to cover the 11 basic screw feed stoker sizes.

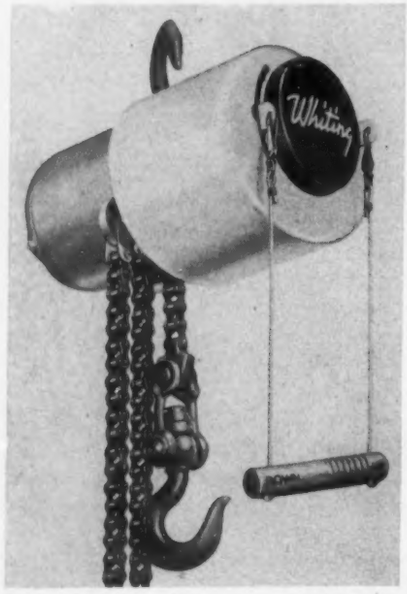
—o—

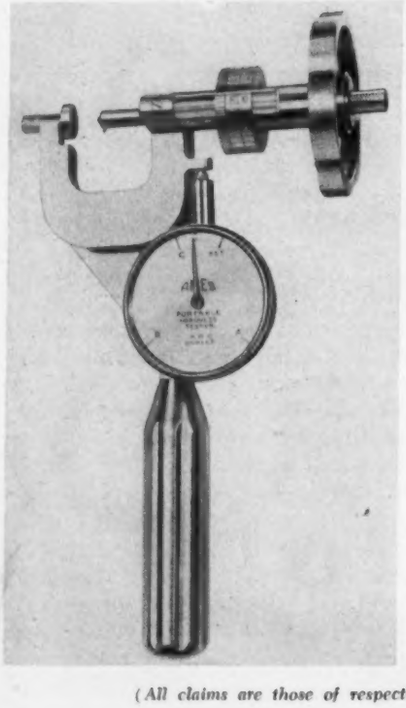
Stainless steels listed by trade names along with the proper Arcos alloy electrodes for welding each and a reference chart on alloy welding are being made available by Arcos Corp., Philadelphia. Steels are listed by AISI type number as well as by manufacturers' number.

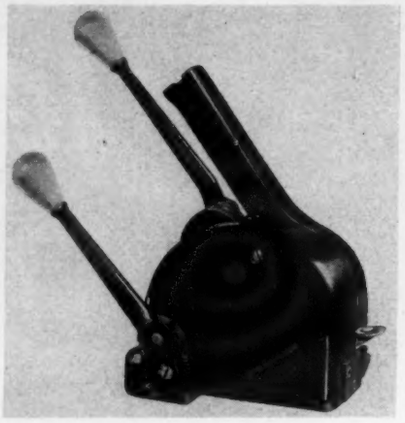
The reference chart includes tables enabling user to determine which electrode should be used with what metal, weld metal chemical analysis, electrode identifications, heat treatments, and other related information.

Industrial Equipment









Steel Strapping Tool

Operation on a flat surface of 5 in., making possible use with narrow packages, is an advantage of the No. 3 Steelstrapper, illustrated above, available from Acme Steel Co., 2840 Archer avenue, Chicago 8. Weighing 6¾ lb, the tool has two levers, one for tensioning, the other for sealing and cutting the strap from the coil. Both levers travel in an arc. Sealer lever automatically returns to starting position after operation is completed. Seals are fed from a magazine holding 100 seals, into the sealer jaws for joining the two loose ends. Alignment is automatic. Tool will handle ¼, ⅜, ½ x 0.010 to 0.020-in. strap.

Steel 2/3/47; *Item No.* 9130

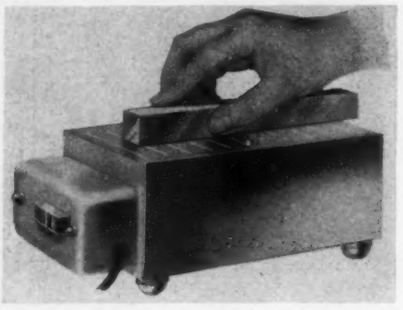
Portable Electric Hoist

Utilizing a double-reduction, totally enclosed, worm-gear drive, a new line of roller chain electric hoists, center left, made by Whiting Corp., Harvey, Ill., is so light that one man can install or move each unit without assistance. Because each hoist frame is a steel casting, the load is carried on steel from hook to hook. A self-energizing motor brake interlocks with controller to provide safe operation. Upper and lower safety limit switches also are provided. Roller chain operates on a large sprocket while load hook swivels on ball bearings. Each hoist is controlled by a bar grip which can be operated with one hand. Hoist can be mounted in an inverted position, if necessary.

Steel 2/3/47; *Item No.* 9116

Portable Hardness Tester

Hardness tests on rounds and flats up to 1 in. thickness may be run on the tester announced by Ames Precision Machine Works, Waltham 54, Mass. Readings are in rockwell scales with diamond and ball penetrators. Brinell readings are easily transposed. Device, at left below, uses a screw action to force penetrators into the material. After it is checked with a test block, its hand wheel is turned until the dial indicator pointer is in the proper position. Actual readings are made on a lucite magnifier of scale numbers on the barrel dial of the tester. Ball penetrator is used for testing soft materials. Both V and round anvils are available. A cast iron base with clamp is also offered for bench use.



Steel 2/3/47; *Item No.* 9117

Demagnetizer

Large and small drills, punches, reamers, tools and dies, that have been in contact with a magnetic chuck or have become magnetized through processing, are demagnetized with unit, directly above, announced by Luma Electric Equipment Co., Toledo 1, O. One pass over flat top grid completely demagnetizes small pieces. For heavy, hard-to-handle pieces, it is only necessary to pass the portable instrument over and around the work. Segments on top of grid effectively spread magnetic field over entire surface, which has a mirror-finish to eliminate possibility of scratching. Units, housed in aluminum case, are offered in three sizes, 4½ x 7¼ in., 7¼ x 7½ in. and 7½ x 14 in.

Steel 2/3/47; *Item No.* 9133

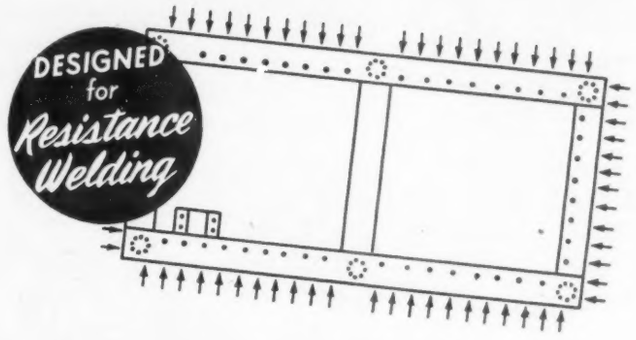
Quenching Furnace

Forced circulation with a motorized pump, producing a minimum of 30 and a maximum of 60 gph, minimum size furnace with effective work clearance and accelerated cooling means are features of the Marquenching furnace, upper left corner, introduced by A. F. Holden Co., New Haven 8, Conn. It may be heated by immersed electrodes, resistance calrod units or under-fired gas burners for hot quenching at temperatures of 300 to 500° F, martempering, austempering, hot quenching stainless steels, tempering operations to 700° F, bright tempering

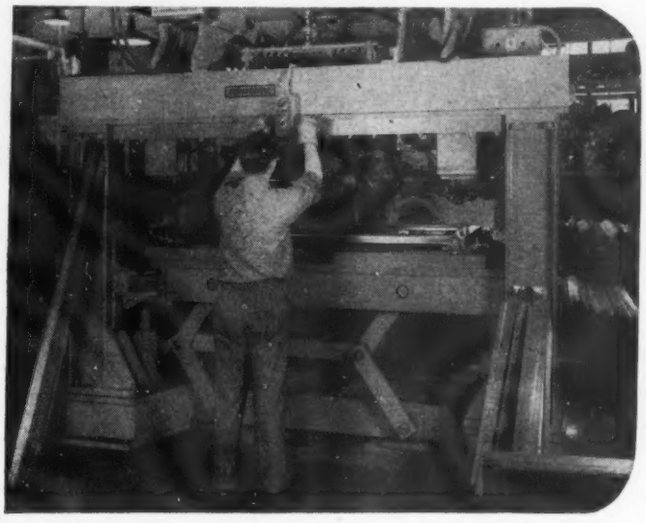
(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 136.)

How spot-welding changed

A BOTTLE-NECK INTO A LINE-PACER



It takes 250 welds to make a Fruehauf door frame. 168 of these welds are made on 3 Progressive machines—16 seconds to a machine, welding time. One of the three is shown below.



Doors used to be the chief bottle-neck in the production of Fruehauf truck-trailers.

Recently Fruehauf design engineers and Progressive Welder process engineers got together. They re-designed the doors for automatic spot-welding. Three Progressive special Ultra-Speed universal welding machines were designed and installed. These not only take care of normal requirements but actually provide 100% reserve capacity for trailer door production.

RH, LH and side door frames (with 250 spot welds each) of several different sizes are assembled on the 3 machines at a rate of 60 complete assemblies per hour. Latch mounting plates and stiffeners are added, using 12 portable Progressive welding guns, with the door in a turntable fixture.

In addition to simpler manufacture and increased productivity per machine-hour and man-hour, Fruehauf also saves floor space and has a better, stronger, door —that weighs 23% less. To the trailer operator that means increased payload.

This is another of the many case histories of "It Pays to Weld Progressive." We will be glad to assist you, too, in "designing for welding"—to lower your costs, increase production and improve your product.

For the latest news on Resistance Welding designs and methods, read the monthly Progressive WELDING PICTORIAL. Ask for it on your company letterhead.

IT PAYS TO WELD

PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT

CABLE ADDRESS "PROGWELD"

MEMBER RESISTANCE WELDER MANUFACTURERS ASSOCIATION RWMA

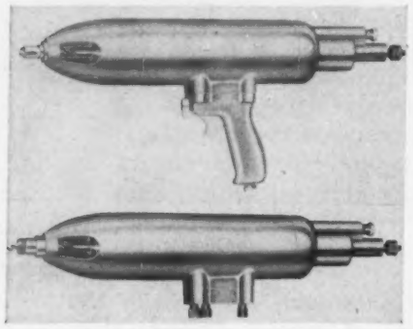
and age hardening of aluminum alloys.

Furnace embodies use of radiation by pumping of liquid from quenching area to outside area of pot, doubling radiation loss. Hot salts are pumped through the areation zone and then flow over a spillway, causing cooling of the liquid. A screen at spillway and a basket in quenching zone serve to remove sludge, metallic particles and lost parts. Practically any type of temperature control equipment can be used with the furnace, which is available in three sizes.

Steel 2/3/47; *Item No.* 9128

Pneumatic Drill Unit

Designed by Valley Tool Co., 5926 Maywood avenue, Huntington Park, Calif., for drilling, step-drilling reaming, counterboring, countersinking, spotfacing, threading and tapping, its pneumatic drills have adaptor bushings to support



drilling units. Units are quickly transferred from one drill jig to another.

Drills consist of a standard pneumatic rotary drill motor mounted in a 2-way air cylinder. Powered entirely by air from a 90 to 100 lb line, they are equipped with a self-contained hydraulic variable feed control forward and a rapid reverse with an adjustable stop for accurate depths. These units are also for portable hand drilling in jigs having large quantities of holes the same size by adding a grip handle with air valve and using a hex-bayonet lock drill bushing in the nose of the drill unit. Unit will handle capacities up to 1 in. at speeds up to 5000 rpm.

Steel 2/3/47; *Item No.* 9092

AC Welder

Equipped with the Arc Booster which augments the current the instant the arc is struck, the Fleet Arc alternating current welder, illustrated here, made by Lincoln Electric Co., Cleveland 1, has exceptional depth of penetration, range of output, economy of operation and safety. Selector switch governs amount of booster current to be used to suit various requirements. Continuous and self-adjusting current control is provided by rotating reactor control which provides setting throughout range of welder. Amperage is indicated on a calibrated dial on face of cabinet. Thermostatic control, which opens magnetic starter

when overloaded, provides a high degree of self-protection for operator, permitting sustained welding at high current values with complete protection against overheating. Welder is manufacured in 200, 300 and 500 amp ranges.

Steel 2/3/47; *Item No.* 9058

Water Clarifier

To assure maximum effectiveness of clarification, with greatest economy of space and chemicals, Liquid Conditioning Corp., New York, has developed a Liquon sludge contact reactor, that combines operations of mixing raw water with coagulating chemicals. It properly agitates the mixture, maintaining a suspended deep sludge bed of previously accumulated precipitates, completely separating clarified water from the sludge, and concentrating impurity-saturated sludge for minimum volume of blowoff.

Precipitated impurities, which form a sludge with the coagulating or softening chemicals, are recirculated so all chemical in the tank is completely utilized. Settling is prevented by a large slow-moving agitator which operates over the entire bottom of the tank. Clarified water is separated from sludge by horizontal outward radial flow with gradually decreasing velocity. A sludge concentrator collects and considerably thickens some of the sludge for blowoff with automatic desludging devices.

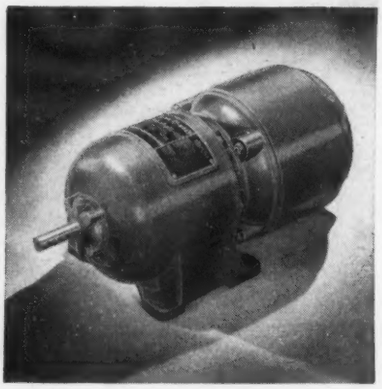
Reactor is well adapted for coagulation of turbid, colored water, for softening of hard well waters by lime-soda, for simultaneously softening and clarifying hard river waters, and for removal of iron, manganese, silica or fluorides from water.

Steel 2/3/47; *Item No.* 9890

Hydraulic Coupling Drive

Link-Belt Co., 307 North Michigan avenue, Chicago 1, announces a new type of packaged power unit, an Electrofluid drive that may be directly connected to a driven machine or speed reducer unit. Available up to 20 hp, it is a compact, motorized hydraulic combination consisting of a general-purpose alternating current induction motor flange-mounted on a housing containing a hydraulic coupling.

The coupling is filled with a light min-



eral oil of steam-turbine quality. When motor drives impeller, it causes oil to flow through runner buckets back to impeller, thereby rotating runner through oil medium. Motor torque is transmitted from impeller to runner by fluid in the coupling. In effect, the fluid coupling inserted between motor and load serves as an automatic clutch, with fluid acting as a cushion. Motor of Electrofluid drive starts at no-load. The motor accelerates quickly, developing torque in the fluid coupling in the ratio of the square of speed, until sufficient torque up to maximum running torque of motor is developed to start driven load.

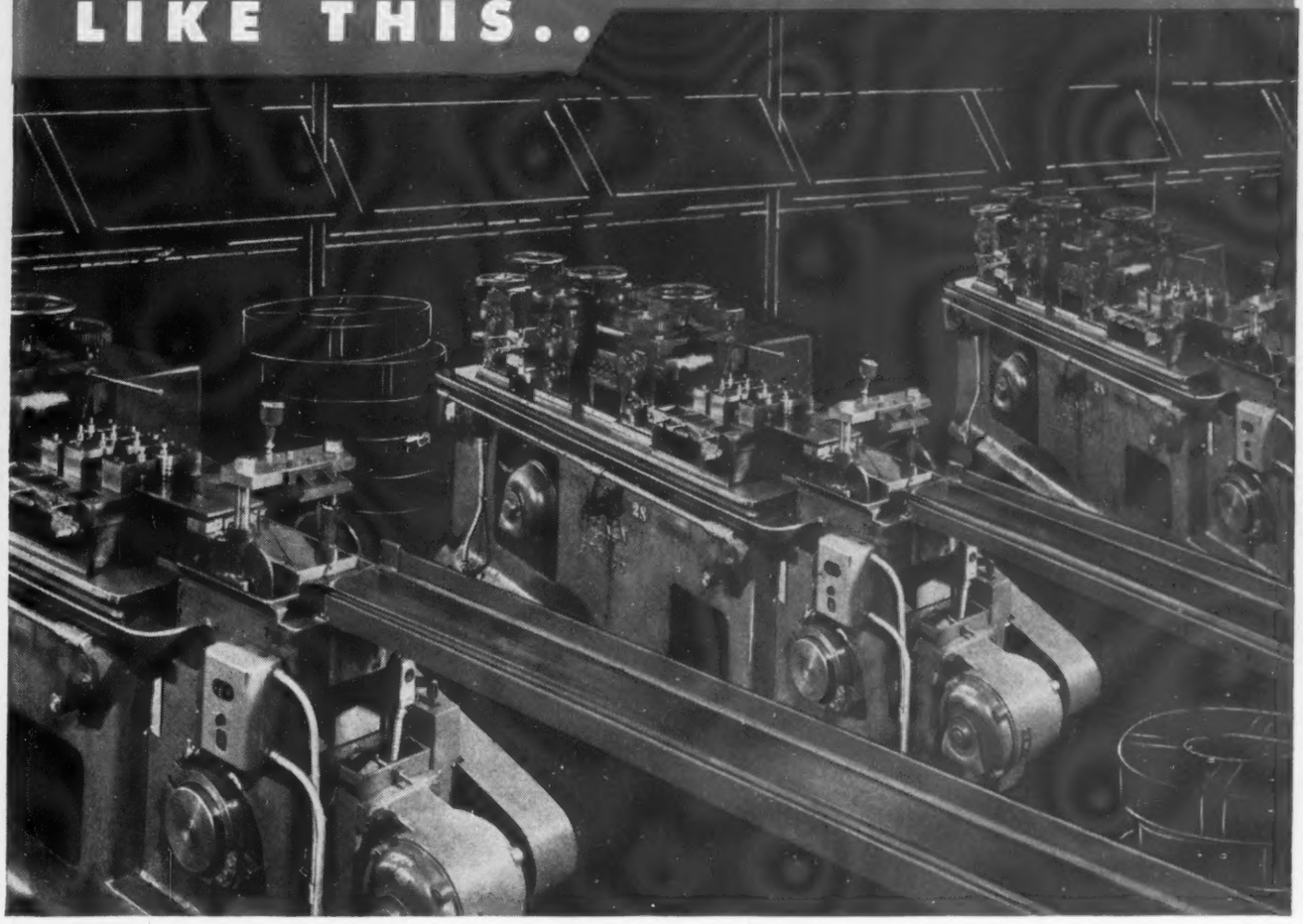
Steel 2/3/47; *Item No.* 9926

Welding Torch

Lite-Ning arc torch for use with both alternating and direct-current welders is announced by Cesco Products Inc., 30 North LaSalle street, Chicago 2. It is designed to give a soft intense heat with no pressure blow or oxides from its carbon arc flame. It can be used in welding aluminum and virtually all ferrous

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 136.)

STEEL ROUND EDGED BY MODERN GENSCO EQUIPMENT LIKE THIS..



REDUCE PRODUCTION PROBLEMS

Do you need steel round edged? With our modern equipment, expert Gensco operators will round edge your steel as well as shear or slit it to your specifications. Your steel is then custom packed to conform with the materials handling and storage requirements of your plant and shipped via the preferred method of transportation.

For information about Edging facilities as well as our complete Specialized Steel Service, call the nearest Gensco office or write, today!

COLD ROLLED STRIP STEEL • SHEET STEEL • COILS AND STRAIGHT LENGTHS • SHIM STEEL • COLD FINISHED BARS • SHAFTING • ROUND EDGE FLAT WIRE • ROUND WIRES • TEMPERED AND ANNEALED SPRING STEEL • FEELER GAUGE • DRILL ROD • STEEL BARS

GENERAL STEEL WAREHOUSE CO., INC.

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YOUR steel requirements can best be served by a progressive, superbly staffed, completely integrated steel producer. WISCONSIN is exactly that.

Progressive is more than a word at WISCONSIN. It's a *fact* that has been demonstrated by our development of Sulfite-Treated Steel—the highly machinable steel that overcomes the faults of resulphurized steels. "H" steels of guaranteed hardenability are a specialty of ours. Both of these steels are earning wide acceptance and acclaim.

Superbly Staffed by top-flight steelmen, WISCONSIN has one prime objective: to make the best possible steel for our customers. Every man in the mill works toward that goal.

An Integrated Organization gives WISCONSIN complete control of the product from the ore mines to the customer. That control means finer steel.

Watch WISCONSIN for steel progress. We can't supply all the steel our customers need but the picture is improving. We haven't compromised with quality. Our sales and metallurgical staffs are ready to serve you.

WISCONSIN STEEL OPERATIONS

Ore Mines • Coal Mines • Ore Freighters
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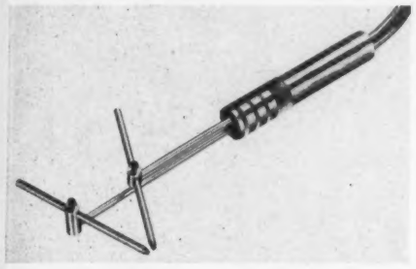
WISCONSIN STEEL COMPANY
(Affiliate of International Harvester Company)
180 North Michigan Avenue **Chicago 1, Illinois**

WISCONSIN STEEL

and nonferrous metals as well as brazing, soldering, preheating and hard surfacing.

Torch features a time-saving automatic arc that simplifies welding procedure. A thumb control permits the operator to

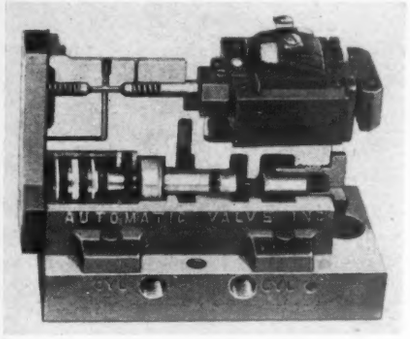


maintain instant adjustment of the arc at all times. Two models are offered, one for ¼-in. carbons and one for ⅜-in. carbons.

Steel 2/3/47; *Item No.* 9982

Solenoid Air Valve

High speed air cylinder actuating machine tool operations are controlled by a model SV-4 four-way, four-port solenoid operated air valve produced by Automatic Valve Inc., 37415 Grand River avenue, Farmington, Mich. Small, compact and



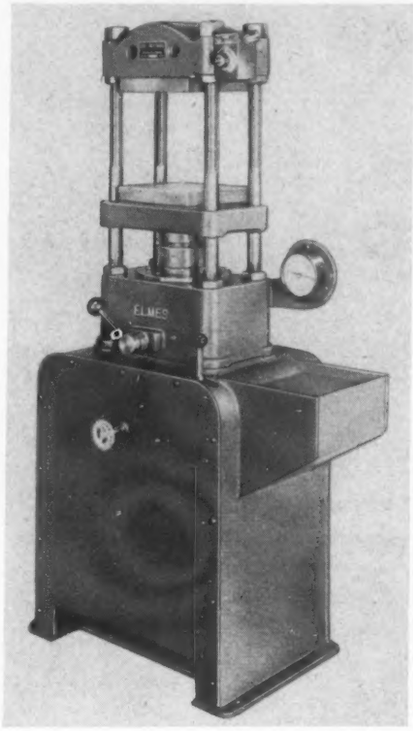
light in weight, it can be mounted close to cylinders, eliminating excessive piping and waste of air. Valves also are made in five port types for differential air pressures of 0-150 lb.

Valves are of the pressure sealed poppet, shuttle type and are stemless with short solenoid plunger travel of ⅛-in. They are made in ¼, ⅜, ½ and ¾-in. sizes. Operating power values are low, being 1.42 amp in-rush at 110 v, 60 cycles, 0.22 amp sealed. All are of noncorrosive aluminum.

Steel 2/3/47; *Item No.* 9994

Hydraulic Press

New line of high-production, fully power-operated, hydraulic presses that have neither motor nor pump are announced by Elmes Engineering Works of American Steel Foundries, 1002 Fulton street, Chicago 7. Compressed air from shop line, introduced above the liquid by a simplified control, provides power for rapid closure and instantaneous full pressure, applies and maintains any desired pressure within capacity range and repeats at that pressure until



reset. Presses are made in 20 and 30-ton bench and floor-type models, and in 50-ton floor-type. Thirty-ton floor-type, shown, has 6 in. stroke and an opening adjustable from 0 to 13 in. It can be equipped with 10 x 10 in. hot plates.

Steel 2/3/47; *Item No.* 9915

Industrial Valves

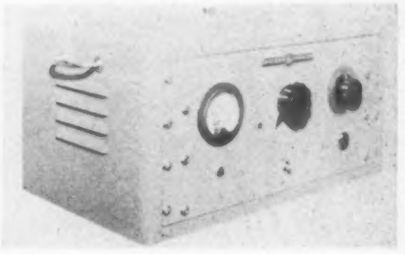
Production of a series of industrial valves incorporating a number of new features is announced by Parker Appliance Co., 17325 Euclid avenue, Cleveland. Available in needle and globe types in sizes up to 1 in. and in both angle and offset designs, the valves are unusually small and compact.

Both types are available in six variations of connection arrangements. Straight-line types are produced with female pipe threads, or with tubing threads for use of flexible tubing. Angle types are provided with female pipe threads, with tube threads, or with male pipe threads at inlet connection and either tube or female pipe threads at side outlet. Tubing is accommodated in a range of from ¼ to 1 in. OD, pipe from ⅛ to 1 in. All valves are provided with integral mounting lugs for convenience in securing valves to brackets or panels to insure leak-proof connections in installations where vibration is a factor.

Steel 2/3/47; *Item No.* 9916

Flaw Detector

Flaw detector that continuously detects and counts holes, weak spots, and conducting paths in thin materials such as sheet rubber and mica, plastic materials

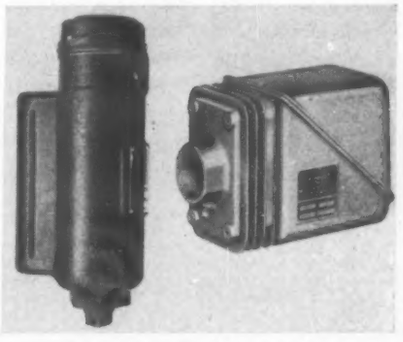


and enamel films on wire is announced by General Electric Co., Schenectady, N. Y. Device, illustrated here, is applied to sheet materials up to 0.025-in. thick moving as fast as 450 ipm, and to wire moving up to 100 ipm. It consists of an electrode assembly through which an adjustable voltage is applied to material undergoing test. An electronic circuit indicates flow of current through the material which occurs when a flaw passes under the electrode. Detector can be made to sound an alarm, operate a recorder or shut down processes.

Steel 2/3/47; *Item No.* 9115

Combustion Control

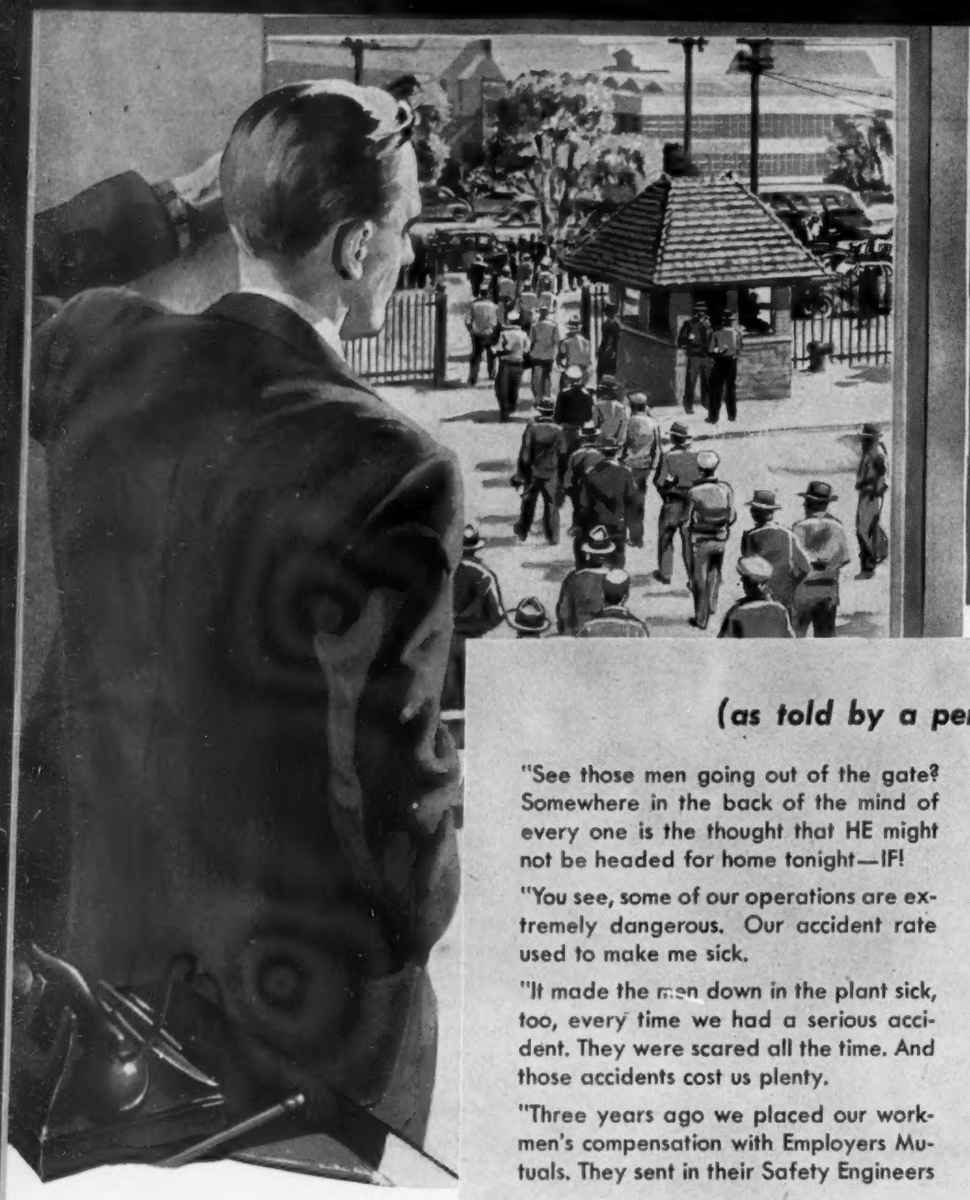
Fireye combustion control, type F18TS, manufactured by Combustion Control Corp., 77 Broadway, Cambridge 42, Mass., combines in a single unit safeguards against flame failure and low



boiler water level in commercial and industrial oil burning equipment. An electric eye that actually sees flame, the device cuts off fuel or sounds an alarm when flame fails.

Unit consists of a phototube and amplifying system housed in a dust-tight alumi-

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 136.)



Why HOME

(as told by a personnel director)

"See those men going out of the gate? Somewhere in the back of the mind of every one is the thought that HE might not be headed for home tonight—IF!

"You see, some of our operations are extremely dangerous. Our accident rate used to make me sick.

"It made the men down in the plant sick, too, every time we had a serious accident. They were scared all the time. And those accidents cost us plenty.

"Three years ago we placed our workmen's compensation with Employers Mutuals. They sent in their Safety Engineers —and those fellows do know their stuff. We thought we knew something about safety—but those engineers were way ahead of us.

"Today we've got a real Safety Program. Accidents just quit happening. It seemed almost like a miracle!

"If it hadn't been for that Safety Program, one hundred and sixty-three of those men going home to supper now would have been killed this year, or laid up in the hospital, or maybe crippled for life. Right here in this plant!

"They're pretty good guys, too."

For the benefit of policyholders . . .

Employers Mutuals have a long experience as one of the largest carriers of workmen's compensation (they wrote one of the first policies ever issued). Their constant effort to provide for the welfare of policyholders has given them unusual insight into the needs of employers and of their employees.

To serve those needs, they have developed Safety Engineering and other services, in order to reduce the number of accidents to employees, and to provide care for injured employees.

You can reduce your insurance costs

All these services are available to you, to reduce your accident frequency and accident severity, thereby reducing the cost of your insurance.

In addition, all savings made through sound, conservative management, over and above provision for ample reserves and surplus, are returned to policyholders in the form of dividends —a further reduction of your insurance costs.

Employers Mutuals write:

EMPLOYERS MUTUALS of WAUSAU

Public Liability . . . Automobile . . . Plate Glass . . . Burglary . . . Workmen's Compensation . . . Fidelity Bonds . . . Group Health, Accident, Hospitalization . . . and other casualty insurance . . . Fire . . . Tornado . . . Extended Coverage . . . Inland Marine . . . and allied lines of insurance. All policies are nonassessable. Branch offices in principal cities. Consult your telephone directory.

163 men WILL BE FOR SUPPER TONIGHT

This leader in Safety Engineering can reduce YOUR accident rates . . . and save you money, too

Employers Mutuals nationally known achievements in Safety Engineering result from the basic principle guiding these progressive companies—to operate for the benefit of the policyholders and their employees.

E-M Safety Engineers were first put to work because high accident rates made workmen's compensation insurance costs a burden to employers. And insurance costs are only the beginning of the price you pay for accidents.

Other costs include lost production, spoiled material and broken machinery, replacement of trained workers, lowered efficiency of others who see an accident—talk about it—are fearful of their own safety.

Get safety-on-the-job

E-M Safety Engineers have developed an efficiently planned and coordinated program that can build safety-on-the-job for you—from the ground up. Engineers survey your plant to analyze the hazards surrounding your employees. Engineering specialists on various machines and industries, chemists, industrial nurses all play their part in such a survey. They make recommendations for eliminating these hazards.

Engineers help you set up a safety program. They provide practical suggestions, posters, literature, films, and other help. Safety education helps your men understand the fundamental principle of safety-on-the-job—that taking time to be safe saves time—and lives.

The Industrial Hygiene department and a staff of industrial nurses help eliminate the causes of occupational diseases. The Employers Mutual nurse will help you set up an efficient first aid department.

E-M Safety Engineering has reduced accident rates as much as 60% to 75%. Even in exceptionally hazardous industries, accidents can be brought under control.

Another service to policyholders and their employees is the effective use of modern physiotherapy laboratories when serious accidents *do* occur. Physiotherapy frequently reduces the time lost following a severe injury, and over and over again has prevented permanent disability.

Ask an Employers Mutuals man for an engineering survey of your plant and recommendations for the safety program you need to reduce your accident rates.

FREE: Write for complete information on Safety Engineering, and for a copy of "A Dictionary of Insurance Terms—How to Understand Insurance and Buy It Intelligently." Write on your business letterhead to: Insurance Information Bureau, Employers Mutuals of Wausau, Wausau, Wisconsin.

GET THIS E-M RISK ANALYSIS ON YOUR PUBLIC LIABILITY HAZARDS

Employers Mutuals engineers can show you, through a Survey and Risk Analysis, how to eliminate most of the hazards that might result in injury to members of the public on your premises or through the operations of your business.

Employers Mutuals combine in one comprehensive policy the several forms of public liability protection needed by manufacturing, mercantile, and contracting firms—protection against claims arising from all the usual and all the unusual chances of loss through bodily injury and damage to property of others.

Only after a survey of the hazards can the proper form of this comprehensive policy be recommended. Then, Employers Mutuals tailor the policy to provide the coverage needed.

Ask the Employers Mutuals man to make a Survey and Risk Analysis of your public liability requirements. This analysis involves no obligation.

. . make Insurance Understandable

EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN
ESTABLISHED 1911
EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
ESTABLISHED 1935
Home Office: WAUSAU, WISCONSIN

num case. Entire control is mounted directly on the furnace wall and is aligned to permit the photoelectric cell to observe the flame through a 2 in. pipe connection. It protects against low boiler water level by means of a single probe which is mounted parallel to the boiler water column and wired to Fireye control. The bottom of the probe defines the danger point below which boiler water must not fall.

Steel 2/3/47; *Item No.* 9999

Cartridge Filters

Ten sizes in three new models of expendable cartridge filters are in production at Bowser Inc., Fort Wayne, Ind. Filters contain replaceable, resin-impregnated, cellulose elements which remove particles as small as 1 micron (0.000039-in.) from liquids. Cartridges are completely neutral, contain no chemical bleach and will not remove additives or inhibitors, or affect color of filtered liquids except by reduction or removal of foreign matter.

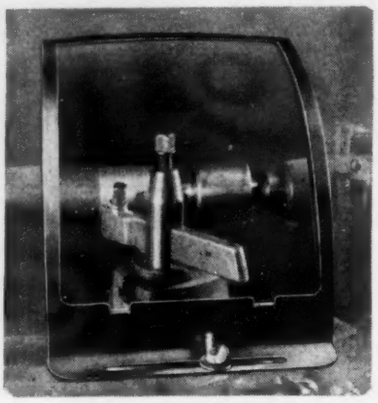
Capacities range from 2/5 to 300 gph with filtering areas from 0.2 to 100 sq ft. All units are equipped with vent and drain valves and bolted covers for cleaning and replacing. Overall dimensions range from 19 to 56 in. in height, and 12½ to 30½ in. in diameter, with pipe connections from 2 to 4 in.

Steel 2/3/47; *Item No.* 9997

Lathe Guard

Lathe and wheel guard which permits complete and continuous work inspection with safety is announced by Standard Safety Equipment Co., 232 West Ontario street, Chicago. Called the Stasafe chip guard, it protects operators from flying particles and oil, without obstructing work or vision at point of operation. The guard is adaptable to lathes, shapers, grinding wheels, tool grinders and other machines.

Guard is constructed with a strong, all-metal frame, and equipped with a



replaceable tough plastic window, curved to permit overall work inspection. A universal attachment on its base permits setting at any angle desired.

Steel 2/3/47; *Item No.* 9986

Screw Finder

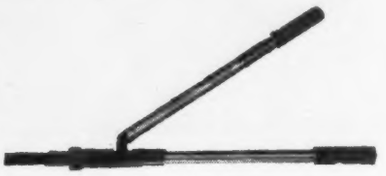
Jackson collet-type screw finder for electric and pneumatic screw drivers starts and completely sets screws in a single operation. The finder, offered by James Industries Inc., Skaneateles, N. Y., is attached to the screw driver. It holds the screw firmly, working in any position, and in places not easily accessible. One hand is left free for positioning work.

Finder is nonrotating and close-fitting to prevent the bit from whipping. Bit is guarded and no impression is left on the screw head or on the work surrounding the screw. Models are available for use with all standard types and sizes of machine as well as with wood screws.

Steel 2/3/47; *Item No.* 9923

Rivet Hand Gun

Designed especially for small-quantity users of the larger sizes (7/32, 1/4 and 9/32-in.) of Cherry blind rivets, the new G-55 hand gun will, when used with an adapter, also install smaller rivets. The hand gun, made by Cherry Rivet



Co., 231 Winston street, Los Angeles 13, is especially useful for field work where air pressure is not available.

Gun operates on ratchet principle, and is lightweight and easy to handle. It is 29 in. long, including the pulling head, and weighs 4½-lb complete.

Steel 2/3/47; *Item No.* 9978

Sand Density Indicator

A molding sand density indicator, which shows weight in pounds per cubic foot of any molding material under a degree of ramming compactness, or under an American Foundry Association standard sand specimen degree of ramming, has been developed by the Harry W. Dietert Co., Detroit. It may be attached to any sand rammer by means of two screws and does not interfere with the other functions of rammer or flowability test.

A known weight of molding material is placed in a 2 in. diameter specimen tube and rammed, for example, with three

FOR MORE INFORMATION on the new products and equipment mentioned in this section, fill in this form and return to us. It will receive prompt attention.

Circle numbers below corresponding to those of items in which you are interested:

9130	9926	9923
9116	9982	9978
9117	9994	9990
9133	9915	9996
9128	9916	9038
9092	9115	9020
9058	9999	9111
9890	9997	9974
	9986	
	2-3-47	

NAME ..... TITLE .....

COMPANY .....

PRODUCTS MADE .....

STREET .....

CITY and ZONE ..... STATE .....

Mail to: STEEL, Engineering Dept.—1213 West Third St., Cleveland 13, Ohio

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DOES YOUR PRODUCT HAVE *Eye Appeal*?

This is the question that every manufacturer producing for the consumer market asks himself. The eye appeal of your product is the silent salesman—the factor that, in many cases, makes the decision for the buyer. The critical buying public demands quality of product, simplicity of operation, easy upkeep, and outstanding appearance when they choose something with which they have to live or work.

To the manufacturer—**MicroRold** Stainless Steel should be considered; *it has eye appeal.* It is readily adaptable to a host of applications in the domestic and architectural fields. It has exceptional physical properties, high strength, ease with which it can be fabricated and improved corrosion resistance insuring lasting beauty and continuing eye appeal.

The Washington Steel Corporation's mill is devoted entirely to the production of **MicroRold** stainless alloys in both sheet and strip form. Produced by a unique, new process, **MicroRold** is supplied remarkably uniform to gauge throughout its entire cross section and length ranging from .004 to .078 inches in commercial tempers and finishes. **MicroRold** is presently supplied in Types 301, 302, 304 and 430 up to 36 inches wide.

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Hartford 7-7028

DETROIT
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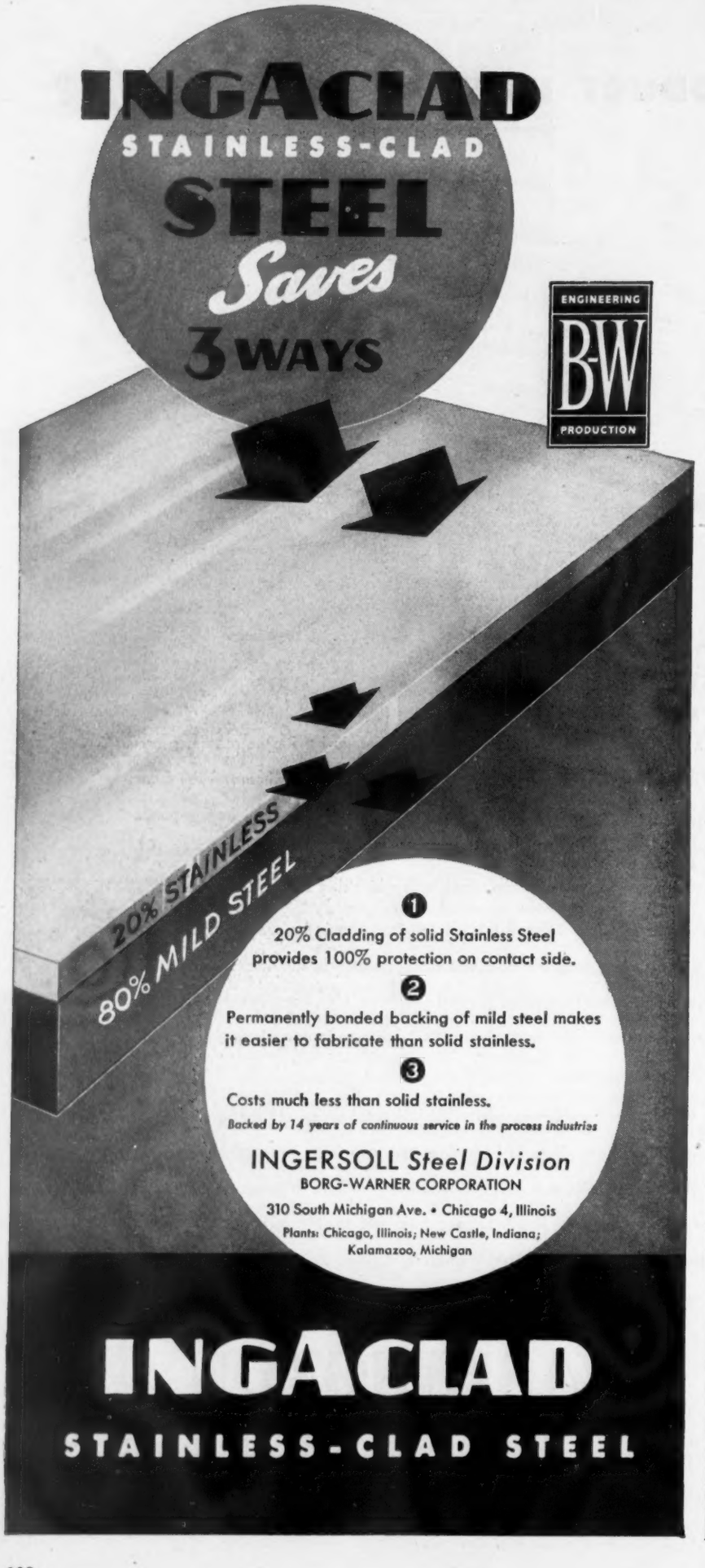
Randolph 3163

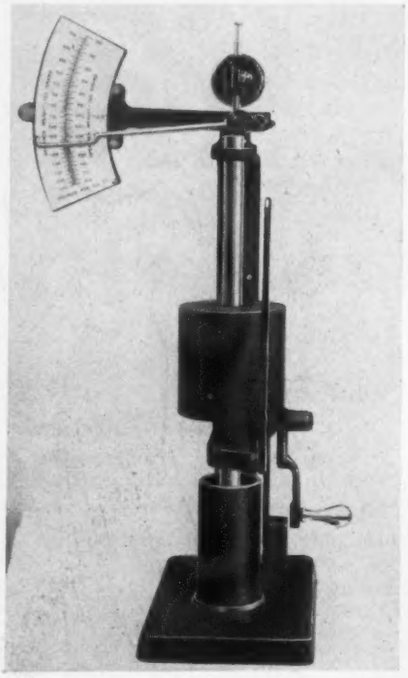
CHICAGO
One North LaSalle Bldg.
Franklin 2735

WASHINGTON STEEL CORPORATION
MicroRold
STAINLESS
SHEET & STRIP

WASHINGTON
STEEL CORPORATION
WASHINGTON, PENNSYLVANIA



drops of the sand rammer weight. Density indicator pointer will show the weight in pounds per cubic foot for that



material when rammed to that specific hardness.

Steel 2/3/47; *Item No.* 9990

Thermostat

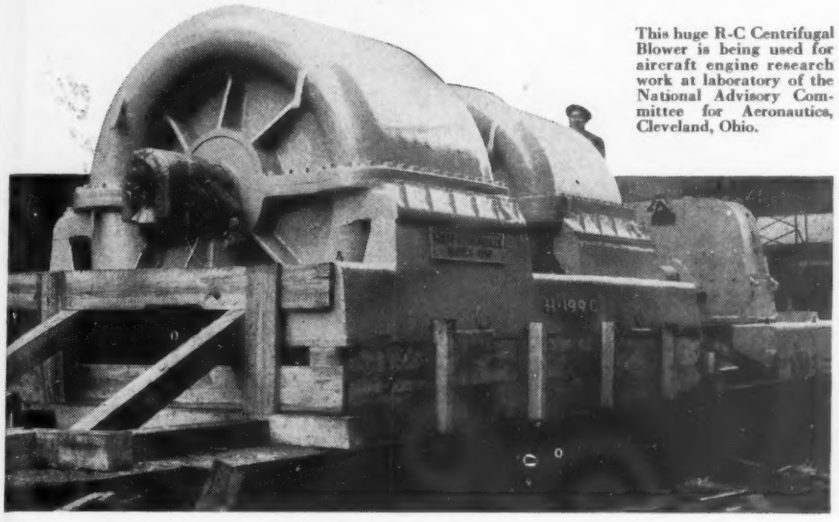
United Electric Controls Co., 71 A street, South Boston, Mass. announces a type MI immersion thermostat designed for close temperature control on quick battery chargers. It is also applicable for controlling temperature of strong liquids, gases and hot plates. Thermostat is supplied with a neoprene sleeve which gives complete protection to unit for applications injurious to brass. It has an electrical rating of 1000 w, 110 v ac, noninductive. The on-off differential is 3° F, and the control is adustable within the range of 0° to 250° F.

Steel 2/3/47; *Item No.* 9996

Observation Platform

An electrically operated platform unit designed for safety and convenience of those who work at various heights above floor levels is announced by Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland 14. Unit (illustrated here) has two platforms, one stationary at a height of 5 ft and the other adapted to be raised or lowered within a range of 8 ft above the floor, thereby providing for observation at 13 ft and adjustments at 15 ft, including body height. Built chiefly of aluminum alloy and mounted on ball bearing, rubber-tired wheels for

Freight car loaded with WIND



This huge R-C Centrifugal Blower is being used for aircraft engine research work at laboratory of the National Advisory Committee for Aeronautics, Cleveland, Ohio.

This freight car packs hurricanes! It's loaded with a Roots-Connersville Centrifugal Blower that in just one minute can push the air out of a 10′ circular tunnel, 450 feet long. Or, it can blow a gentle breeze, too, if that's what is wanted.

Not all industrial blowers are that big. But whether they're big or little, Roots-Connersville builds them down to the small Rotary Positive units delivering only ten cubic feet per minute. With both Rotary and Centrifugal equipment to choose from, our engineers can recommend the size and type that will precisely match your requirements. That's R-C *dual-ability*.

For any problem involving the profitable movement of air or gas, call on R-C *dual-ability*, based upon almost a century of specialized experience.

ROOTS-CONNERSVILLE BLOWER CORPORATION
702 Steelton Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE ROTARY CENTRIFUGAL

BLOWER BUILDERS R-C SINCE 1854

BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

LET US PROVE THE VALUE OF *R-C dual-ability*

Your questions on the more profitable handling of air or gas will be welcomed by Roots-Connersville engineers. Check the following list for suggestions and we'll gladly supply information on your requirements.

- Pneumatic conveying systems
- Tunnel ventilation
- Acid-making processes
- Liquid aeration and agitation
- Grain conditioning or bleaching
- Departmental gas metering
- Heat-treating and annealing
- Vacuum filtration processes
- Boosting gas system pressure
- Priming centrifugal pumps
- Transporting live fish
- Supplying safety helmet air
- Mining and smelting
- Unloading tank cars and trucks
- Supercharging or scavenging Diesels
- Paper mill vacuum processes
- Drying textile yarns
- Reducing explosion hazards

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702 Steelton Avenue,
Connersville, Indiana
Please send information on:

BLOWERS_____ EXHAUSTERS_____
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BOOSTERS_____ INERT GAS GENERATORS_____
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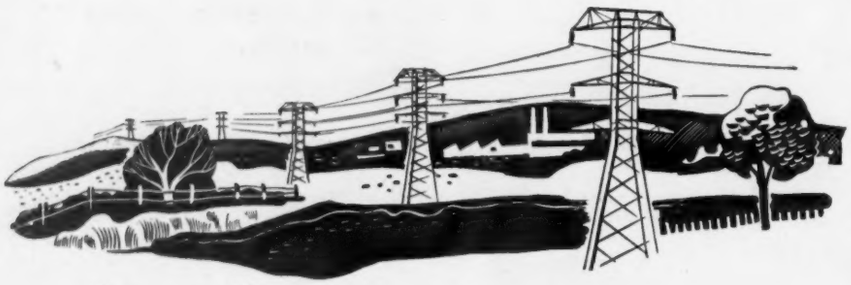
Need Ready Electric Power?

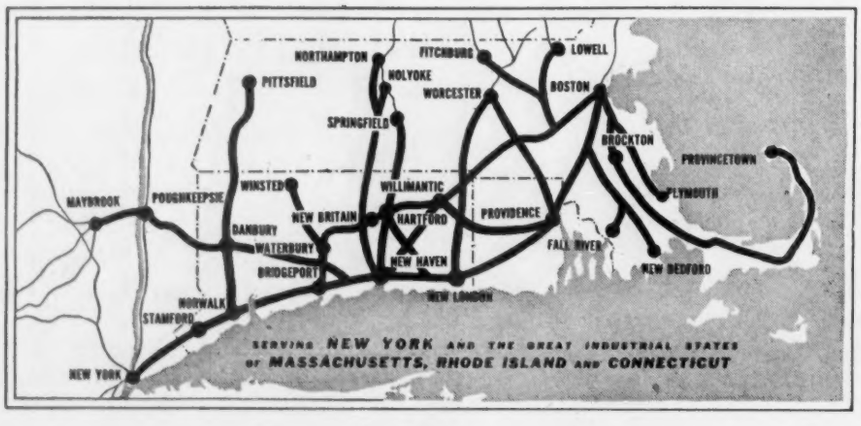


Billions of Kilowatt Hours are produced annually in Southern New England.

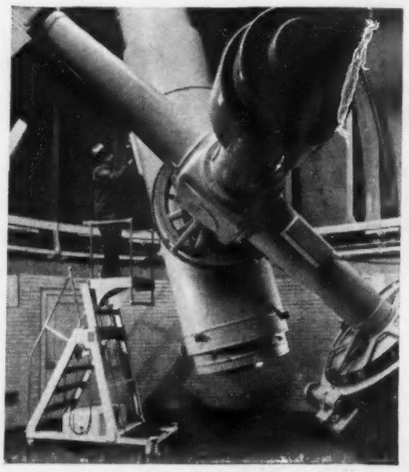
The high concentration of industry in Southern New England has resulted in a network of power facilities second to none in America. In this compact area, transmission lines are short and industry is assured of an adequate and dependable power supply at reasonable rates through numerous inter-connected feeder lines.

A well-integrated power supply is just one of the many industrial advantages to be found in Southern New England. For more facts on all the benefits available for your new plant location, write for the new booklet, "SOUTHERN NEW ENGLAND FOR TOMORROW'S INDUSTRY." Address: P. E. Benjamin, Mgr., Industrial Development, New Haven R. R., Room 201N, 80 Federal Street, Boston 10, Mass.

THE **NEW HAVEN** R. R.



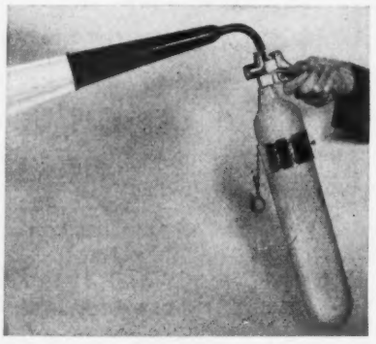
one-man moving, it has a base of 3 x 6 ft with electric motor, reduction gear and winding drum for hoist cables enclosed in base. Capacity of truck is



500 lb. Operating current is derived from building circuit through a flexible cable.
Steel 2/3/47; *Item No.* 9038

Fire Extinguisher

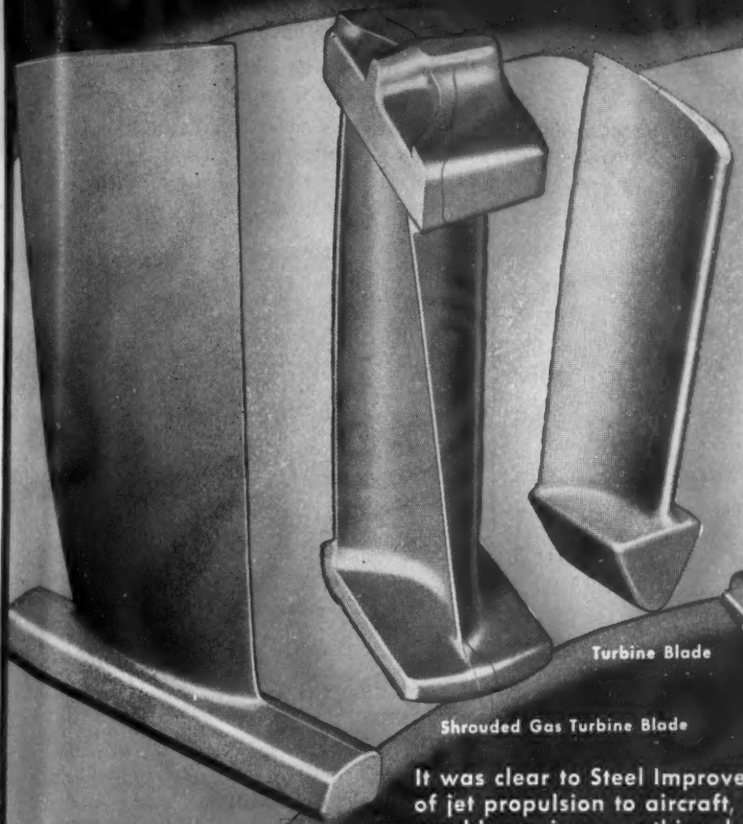
With contents weighing 3⅝-lb, but expanding upon release to 450 times their contained volume, the Speedex carbon dioxide fire extinguisher, developed by American-LaFrance-Foamite Corp., El-



mira, N. Y., is 3 9/16-in. in diameter and 22 in. long. It is operated by a squeeze type valve which releases the extinguishing agent by palm pressure. The gas, noncorrosive, nonpoisonous and odorless, is a nonconductor, will not freeze and will not support combustion. It can be used for extinguishing small fires in oils and greases and in small electrical hazards.
Steel 2/3/47; *Item No.* 9020

Horizontal Unit

Horizontal unit illustrated here becomes a permanent, integral part of any model Bridgeport vertical turret milling machine. With this device, built by Malnar Machine & Tool Co. Inc., 19301 St. Clair avenue, Cleveland 10, errors due to resetting from vertical to horizontal are eliminated. After job is set up, work is



STEEL IMPROVEMENT

FORGED TURBINE BLADES ARE ALWAYS Dependable

Turbine Blade

Auxiliary Engine Turbine Blade

Shrouded Gas Turbine Blade

Axial Flow Compressor Blade

It was clear to Steel Improvement Engineers, at the initial stage in the application of jet propulsion to aircraft, that the forging of turbine blades, buckets and wheels would require something beyond traditional forging techniques. There followed the immediate adoption of an attitude in which the urge to pioneer, to persist in the effort to discover and establish correct techniques for forging high temperature alloys to close tolerances, was given the utmost freedom of action. Responding to the irrepressible urge to forge correctly these essential parts, funds were generously appropriated at the beginning to obtain or develop suitable equipment and to conduct experimental forging. Success crowned this effort. Thousands of these vital parts have been formed of the new high temperature alloys by drop forging to close tolerances. On the basis of long experience in forging intricate designs, and of the specialized metallurgical and engineering skill acquired, it is now possible for Steel Improvement Forging Engineers and Metallurgists to: (1) know the exact forging technique that should be utilized for developing fully the qualities, inherent in the alloy, that are required to meet the high stresses occurring in modern aircraft engines; (2) avoid costly experimentation in forging, heat treating and machining blades, buckets and wheels; (3) advise and assist designers regarding the correct placement of parting lines and other design elements; and (4) adhere strictly to a policy of projecting a promise only when the accomplishment of the work can be substantiated by fact or experience or both.

THE VITAL ELEMENT IN THE IMPROVEMENT OF METALS BY FORGING IS MEN!

Backed by over 33 years of forging production experience, Steel Improvement Engineers and Metallurgists have under their direction complete facilities for performing the highly specialized work of forging, heat treating and machining turbine blades, buckets and wheels of high temperature alloys. These facilities constitute a Turbine Forgings Division, the authority and responsibility of which encompasses all required phases of engineering, metallurgy, production and inspection to assure you dependable forgings.

Turbine Forgings Division

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THE STEEL IMPROVEMENT & FORGE CO.

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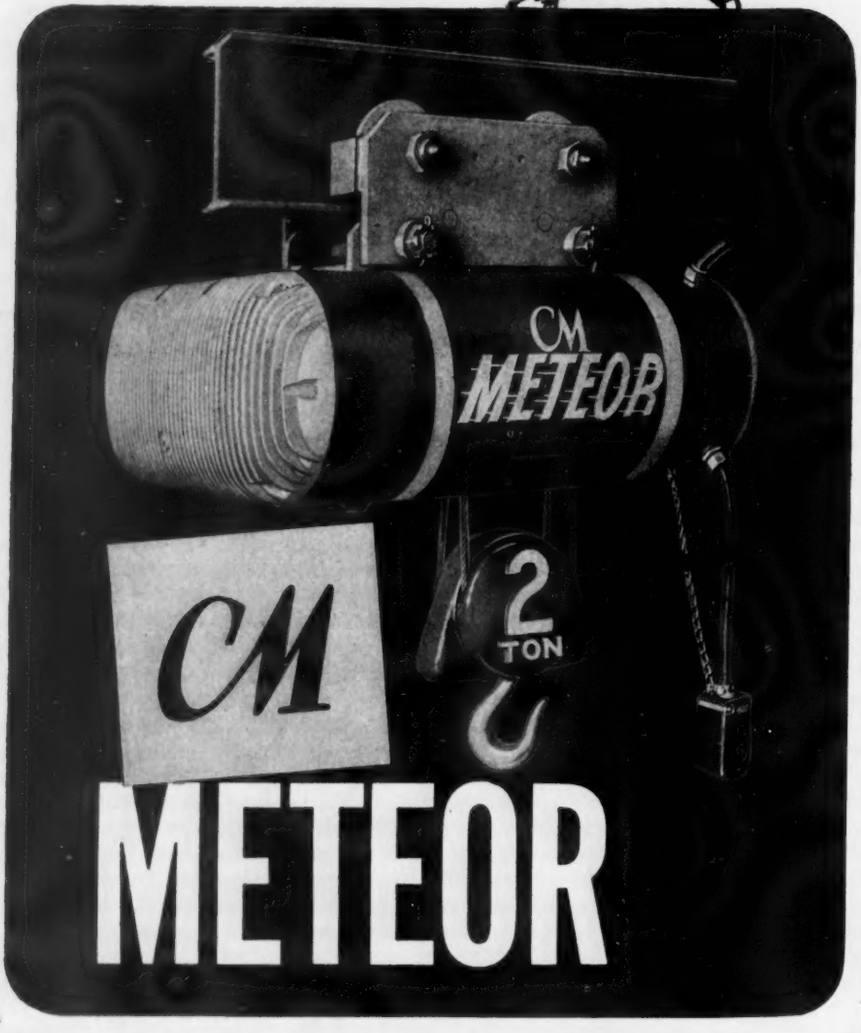
Watch this Electric Hoist cut handling costs



CM METEOR

SEE the speedy Meteor in action and you'll agree that materials handling costs are down for the full count. This heavy duty electric hoist is an outstanding performer . . . a time and money saver. Helical gears, airplane type cooling, low headroom, thermal protection, only 110 volts at push button station . . . and speed . . . are but a few of the Meteor's notable features. Bulletin 142 will tell you about all of them. Better still, the Meteor itself will bring you all of them.

Capacities from ½ ton and up. Lifting speeds from 18 to 60 feet per minute.

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HOIST CORPORATION
(Affiliated with Columbus McKinnon Chain Corporation)
GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.
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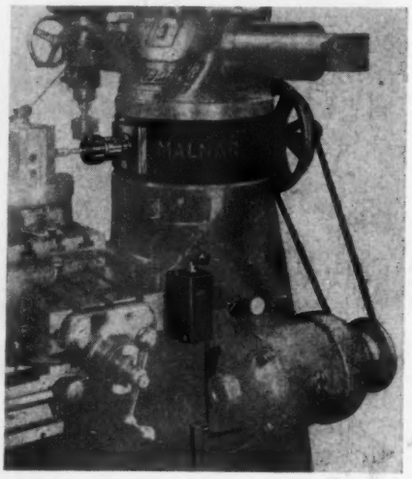
done vertically with milling machine, then horizontally on the attachment.

Unit is furnished with horizontal housing, heat treated and ground spindle, roller bearings, floating motor mounting, reversing switch, a 6-step pulley and

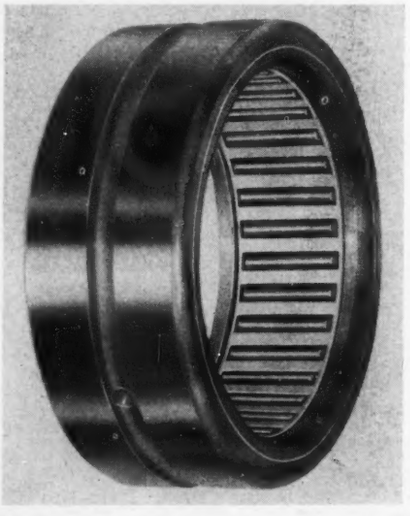


V-belt. Furnished spindle is a No. 10 Brown & Sharpe taper. Spindle is capable of end milling, by cutting, boring and drilling, at varied speeds of 125 to 3000 rpm.

Steel 2/3/47; *Item No.* 9111

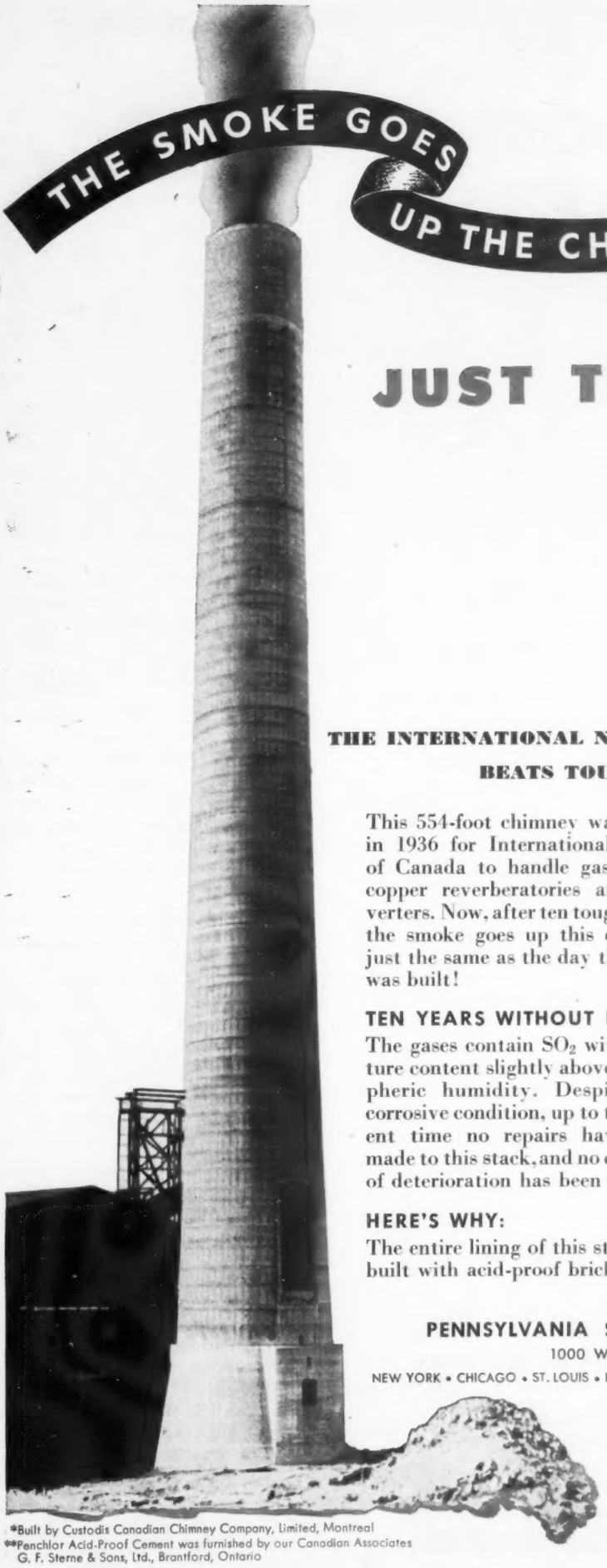
Cage Type Needle Bearing

Adapted for spindles and high speed applications, a new cage type needle bearing assures permanent alignment of rollers in either vertical or overhung positions. Made by Orange Roller Bearing Co. Inc., 557 Main street, Orange, N. J., its rollers run in a cage, fabricated of



antifriction, nonferrous metal. Cage pockets are coined to the contour of the rollers and cage land revolves on the outer race, preventing cage pockets from wearing on the rollers. Bearings are manufactured in a wide range of shaft sizes.

Steel 2/3/47; *Item No.* 9974



JUST THE SAME!

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED

BEATS TOUGH CORROSION CONDITION

This 554-foot chimney was built* in 1936 for International Nickel of Canada to handle gases from copper reverberatories and converters. Now, after ten tough years, the smoke goes up this chimney just the same as the day the stack was built!

TEN YEARS WITHOUT REPAIR

The gases contain SO_2 with moisture content slightly above atmospheric humidity. Despite this corrosive condition, up to the present time no repairs have been made to this stack, and no evidence of deterioration has been noticed.

HERE'S WHY:

The entire lining of this stack was built with acid-proof brick laid in Penchlor Acid-Proof Cement.** In addition the top fifty feet of this stack was further protected by using Penchlor Acid-Proof Cement for pointing the outside surface joints. Penchlor Acid-Proof Cement is a superior sodium silicate cement that is quick-setting and self-hardening. Its outstanding record of satisfactory service has been proved in chemical plants, steel mills, paper and pulp mills, oil refineries and smelting plants.

SEND FOR CASE REPORT

If you have a corrosion problem, you'll be interested in further details about this Penchlor installation, as well as an illustrated brochure on Penchlor. Write for Case Report Number 62-2.

Special Chemicals Division

PENNSYLVANIA SALT MANUFACTURING COMPANY

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PENN SALT

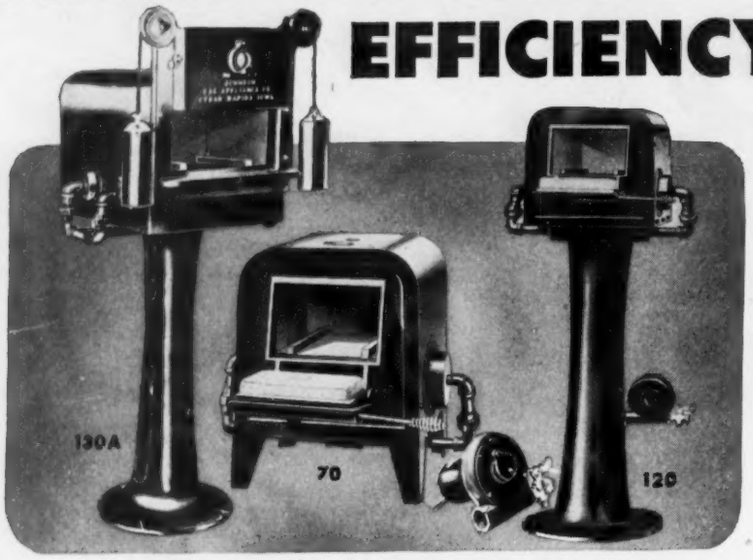
CHEMICALS

97 Years' Service to Industry

*Built by Custodis Canadian Chimney Company, Limited, Montreal

**Penchlor Acid-Proof Cement was furnished by our Canadian Associates G. F. Sterne & Sons, Ltd., Brantford, Ontario

HIGH SPEED EFFICIENCY



THAT CUTS PRODUCTION COSTS

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Reduce toolroom bottlenecks and eliminate unnecessary lost time waiting for tools and dies. Heat treat high speed steels, harden high carbon steels, braze carbide tipped tools in your own plant. There's no waiting for *Quick Acting* JOHNSON Hi-Speed Heat Treating Furnaces. They are ready for action to produce high uniform temperatures quickly and at remarkably low fuel cost. Wide temperature range can easily be regulated with accuracy to handle ANY steels or for hardening small metal parts. Install *Quick Acting* JOHNSON Furnaces on your firing line and turn the heat on production. There's a size for every toolroom and shop. Write for descriptive literature.

No. 130A Hi-Speed
For steels requiring 1400 to 2300°F.
Firebox 7¾ x 13 x 16½.
Four burners.
$325.00

No. 70 Hi-Speed Bench Furnace
2250°F. in 30 Minutes
Treats all steels.
Firebox 5 x 7¾ x 9.
Two burners.
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No. 120 Hi-Speed
1500°F. in 5 Minutes.
2300°F. in 30 Minutes
Firebox 5 x 7¾ x 13½.
Two burners.
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ALL PRICES F. O. B. FACTORY

Furnaces described are complete with Carbofrax Hearth, GE Motor and Johnson Blower

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Complete JOHNSON Catalog
Write for Free Catalog describing all time saving, cost cutting JOHNSON Furnaces for pot hardening, melting, annealing, and heat-treating purposes.

Automatic Welding

(*Continued from Page* 97)

circuit for that gun. The disk passes on at high speed to uncover port No. 2 and the same cycle is repeated for gun No. 2, etc.

Reasons for the use of multiple cams and breakers are to permit a wide range of adjustments. Thus the four-speed control cams control four air valves. These enable a wide speed variation of the air motor according to the length of dwell desired. The four heat-control cams permit a broad selection, from 0 to 100 per cent of heat, by means of transformer taps—or phase-shift heat control, if desired. The breakers have 180-degree cams and rotate a total of 360 degrees for each position of the disk. Use of two breakers, connected in series, permits full range of stepless adjustment for weld time. Cams are made up in segments, permitting easy change to alter welding conditions for any one gun.

Current to all the guns is supplied by a single water-cooled transformer. The electrical circuit is close-coupled in the machine so that there is very little reactance in the circuit and electrical efficiency is high. This feature permits the maximum use of welding transformer capacity for actual welding.

High air pressure up to 1000 psi is provided by a compressor driven through a 5-hp ac motor.

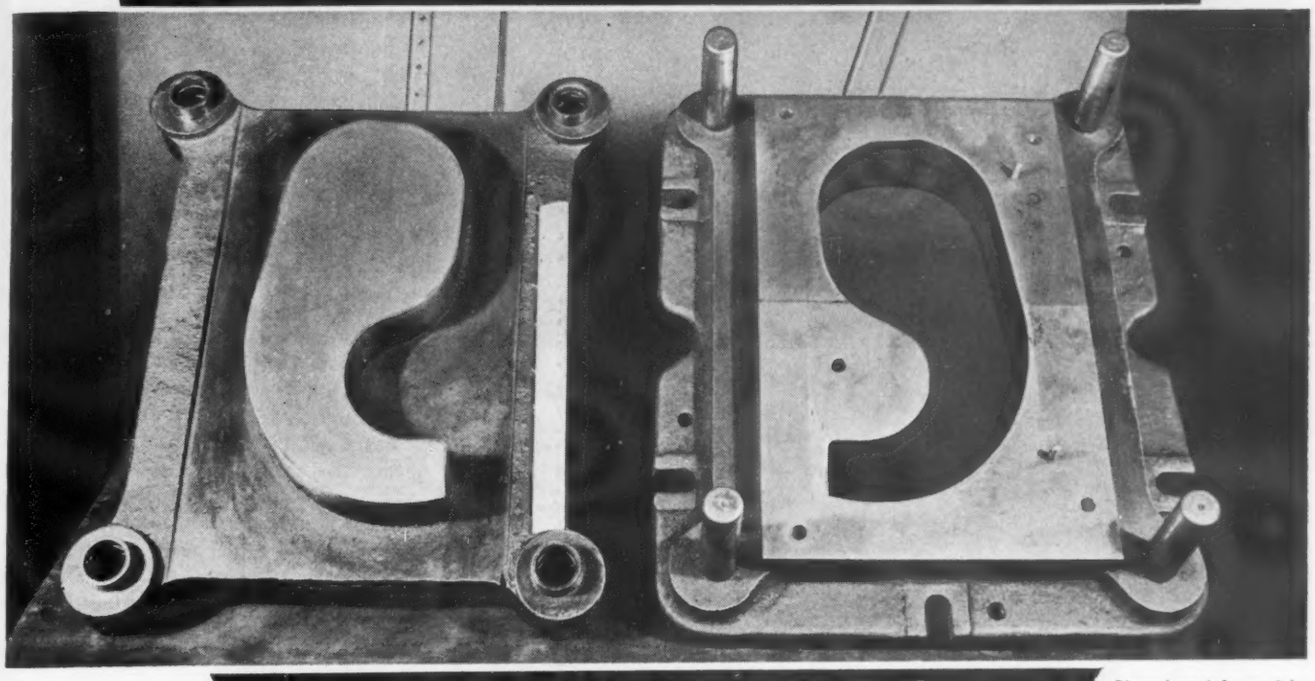
Second new machine is a storage battery powered flash welder designed for welding aluminum, which requires excessive power.

The machine is shown in Fig. 3 flash-welding miter joints of extruded aluminum window sash. The battery-powered unit does the job with a maximum line demand of 18 kva (to keep batteries charged) balanced on 3 phases and at approximately 90 per cent power factor. This is about the same power requirement as for a 10 to 15 hp 3-phase motor. The 16-cell 8 v water cooled battery power pack supplies up to 38,000 amp.

Combined use of a Reeves variable drive, a cone-drive gear speed reducer and a Fawick air clutch-brake takes care of the high acceleration, high upset forces, and high deceleration required. Chief reason is that the extremely high load-carrying capacity of the gearing also permits use of a compact gear-box, greatly reducing inertia forces at the speeds involved. When flash welding aluminum, speeds are 5 to 20 times as great as for steel since the flash weld cycle is approximately 1/3 to 1 sec, compared to 3 to 60 sec for steel.

The cam follower roller is carried on a pivoted arm which is connected by a link to the moving platen, absorbing the tangential component developed as the

FOR INTRICATE TOOLS AND CROSS SECTIONS THAT REQUIRE DEEP HARDENING



Die and punch for special cutting tool. Made from Mansil Die Steel.

DISSTON
MANSIL DIE STEEL

This is one of the most dependable tool steels ever made, and it can be relied upon fully in forging, machining, grinding and heat treatment. Because of minimum distortion and excellent machinability, Mansil Die Steel is specially recommended for complicated dies and punches, particularly where cross sections must be deeply hardened.

Mansil Die Steel can be annealed very soft with the carbides spheroidized for machinability. Upon correct heat treatment this structure changes to a fine martensite. The fracture grain, too, will be fine, ranging from 9 to 10 Shepard.

When properly hardened and drawn, Mansil Die Steel has a tensile strength in excess of 350,000 lbs. per sq. in. At a working hardness of Rockwell C-60 to 61, the elastic limit will be over 300,000 lbs. per sq. in.

Use Mansil Die Steel for cutting, blanking and forming dies and numerous other applications where an exceptionally high quality tool steel is required.

ANALYSIS

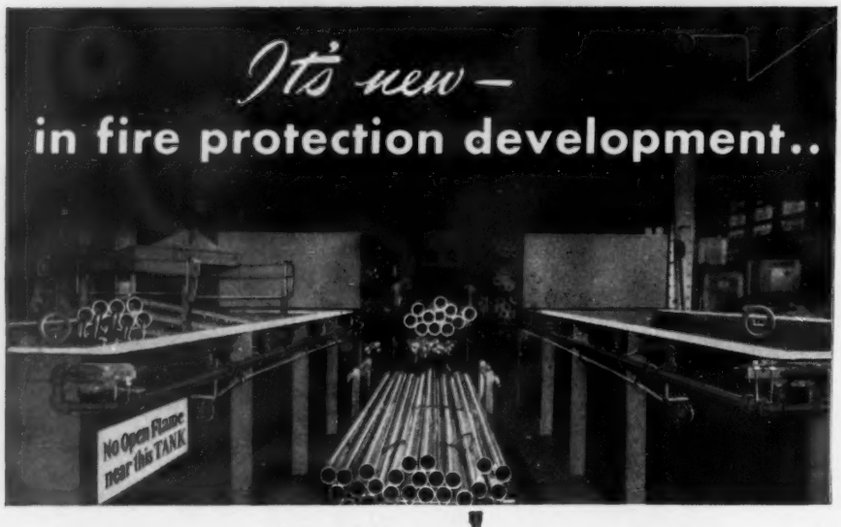
Carbon . . .	.90%
Manganese .	1.15%
Chromium . .	.50%
Tungsten . .	.50%

ESTABLISHED 1840 TRADE MARK REG. U.S. PAT. OFF.

LET DISSTON ENGINEERS HELP SOLVE YOUR TOOL STEEL PROBLEMS

Disston engineers and metallurgists will be glad to help you with any tool steel problem that may confront you. Write in confidence, giving full particulars.

HENRY DISSTON & SONS, INC., 226 Tacony, Philadelphia 35, Pa., U. S. A.



It's new—
in fire protection development..

..combination "Automatic" FIRE-FOG and Foam

• IT BLANKETS • IT ISOLATES • IT QUENCHES •

HERE'S an actual photograph of the newest development in the art of fire protection. It's a combination "Automatic" FIRE-FOG and FOAM system which is safeguarding hazardous tube cleaning operations at one of this nation's largest metal producing plants. The FOAM unit is attached directly into the FIRE-FOG piping, thus giving immediate application of both FIRE-FOG and FOAM from one and the same control system. Sensitive heat detectors allow for the system's actuation; and protection of equipment and adjacent areas, as well as control and extinguishment of fire . . . all realized within a moment's time.

An installation such as this is further proof of "Automatic" Sprinkler's leadership in fire protection development. Always, the difficult problems have been brought to "Automatic" and, with their solution, a wealth of experience has been accumulated — through the test of service.

•

Have you some fire hazard problem that's causing concern? Why not let our engineers and technicians assist in its solution? Write or call "Automatic" Sprinkler Corporation of America, Youngstown 1, Ohio.

•

"Automatic" Sprinkler devices and systems are listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories.

THE SUPROTEX* SPRINKLER SYSTEM

A famous member of the "Automatic" Sprinkler Family. Designed particularly for use in manufacturing, mercantiles, warehouses, churches, schools, offices, hospitals, piers and other establishments where positive fire protection is a must.

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FIRE PROTECTION

DEVELOPMENT ENGINEERING

"Automatic" Sprinkler

MANUFACTURE INSTALLATION

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

YOUNGSTOWN 1, OHIO

OFFICES IN PRINCIPAL CITIES OF NORTH and SOUTH AMERICA

roller hits the upset block in the cam. It thus eliminates the resultant lateral thrust which might tend to make the moving platen bind in its ways.

A variation of plus or minus 20 per cent in operating voltage of plus or minus 30 per cent in platen feed rate is apparently permissible without affecting weld quality. On the battery machine, variation in upset current duration may be varied from 1/20 to 1/6-sec without affecting quality of the weld.

Comprehensive Book on Shot Peening Published

Metal working craftsmen have long known that cold hammering of iron and steel improves its quality—makes it tougher and more durable. For instance, the blacksmith continued to hammer the spring or sword long after it had cooled below the normal forging temperature. No longer an art, but a closely defined process, its modern counterpart is shot peening, and instead of actual hammering, the surface treating is done by metallic shot.

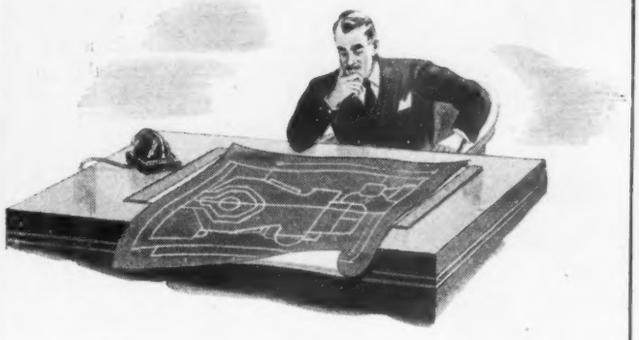
This bit of historical background of shot peening is contained in the book entitled "Shot Peening", a recent publication of American Wheelabrator & Equipment Corp., Mishawaka, Ind. Priced at $1.50 per copy, its 128 pages contain much data on the benefits of the process, equipment used, the shot and factors to be considered in using the process itself.

One chapter is devoted to the relative merits of airless blasting versus air blasting in shot peening and another discusses the sizes, types and materials used in the shot.

Part II of the book is written by H. F. Moore, research professor of engineering materials, emeritus, of University of Illinois and a member of the research committee on fatigue of metals, American Society for Testing Materials. Complete with photomicrographs, diagrams and tables, it considers the technical aspects of shot peening process.

Determines Chain Loads

Maximum safe load that a sling chain can lift at any given angle can be figured with a computer offered by S. G. Taylor Chain Co., Hammond, Ind. To use, the hooker sights through the window of the computer on one leg of the sling chain. He then moves the needle of the computer to line up with the leg that is sighted. Angle of the chain is read at the end of the needle. Safe working load for size chain being used may then be found on scale on opposite side of computer.



When you think of Castings

...consider Forgings

and when you consider Forgings GET IN TOUCH WITH TUBE TURNS

In Re: Product Improvement

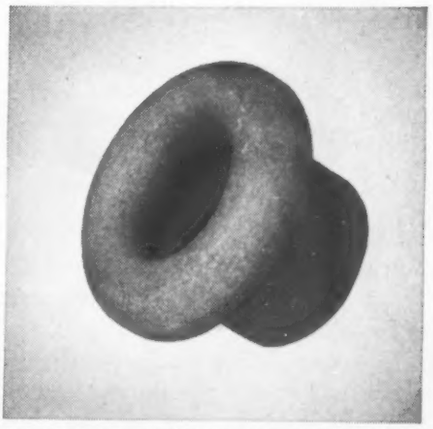
IF you manufacture mechanical equipment, consider forgings for all parts which take the punishment. Forgings are not subject to porosity, shrinkage cracks or hot tears—weaknesses common to castings and the cause of many rejects and failures. The moderate additional cost is more than made up by increased stamina and user satisfaction.

And forgings *can* be had, when you deal with TUBE TURNS—better forgings.

Modern mechanical presses and upsetters are coordinated under one roof with complete die designing, die making, laboratory, and rough machining facilities.

TUBE TURNS (Inc.), 224 East Broadway, Louisville 1, Kentucky. Telephone Wabash 7551.

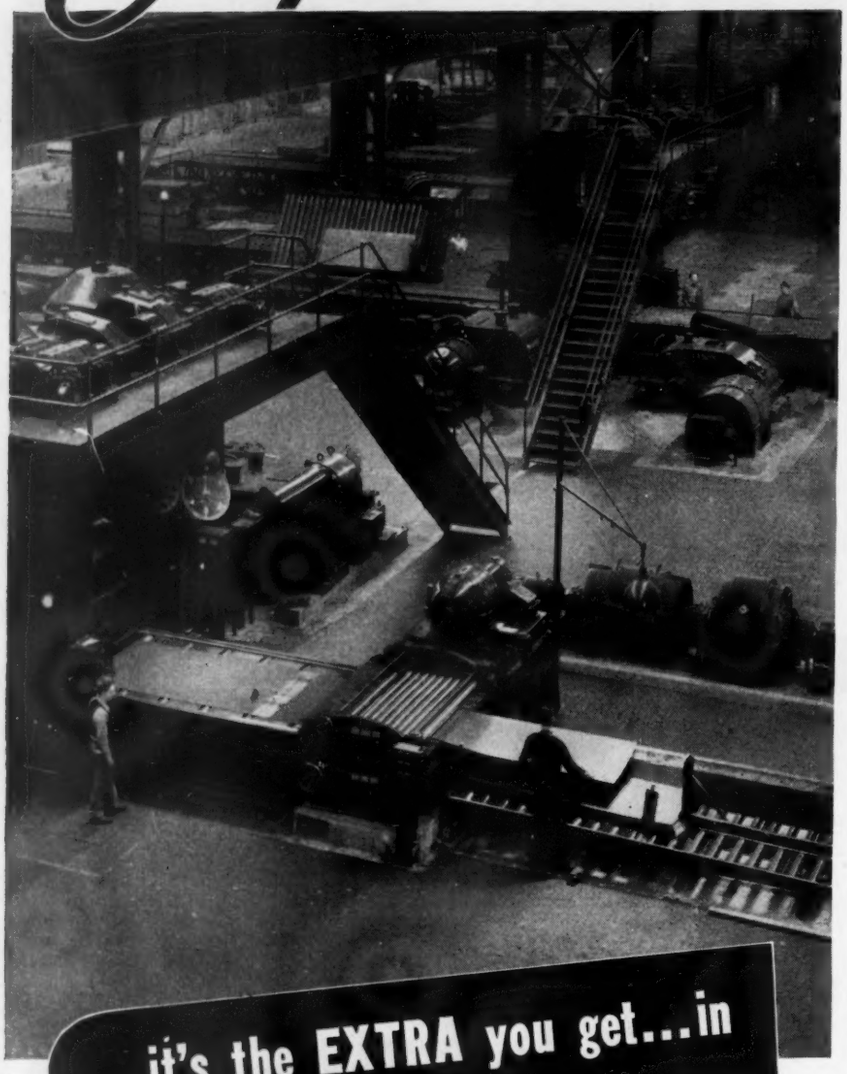
DISTRICT OFFICES at New York, Washington, D. C., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Houston, San Francisco, Los Angeles.



Coil spring retainer. Typical of the "round jobs" which are a TUBE TURNS specialty—forgings which require maximum forged tensile strength and must be economically turned out in mass-production quantities.

TUBE TURNS tt Forgings for Industry

Engineering IS OUR BUSINESS..



..it's the EXTRA you get...in Logan Conveyors

The Logan Delivery Belt shown above forwards sheet from cold mill . . . to leveller . . . to piler table.

John Q. Public selects a particular motor car—radio—or washing machine, because of extra features he desires. Buyers of industrial equipment do likewise. That is why Logan Conveyors, with a plus emphasis on engineering, are so frequently specified in the nation's leading mills and industries. This "engineering extra" means maximum production economies in time, effort, space, and employee satisfaction, with a Logan installation.

LOGAN CO., INC., 535 CABEL STREET., LOUISVILLE 6, KY.

Induction Hardening of Steel

(*Continued from Page* 101)

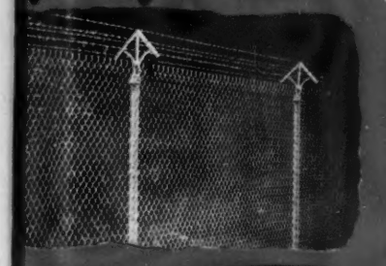
trated in Fig. 43, where the quenched structure of a small sample heated 3 sec at 850°C is compared with a sample heated 3 hours. Note that the specimen heated 3 hours has more retained austenite, and a slightly lower hardness than the specimen austenitized for 3 sec. The homogenization treatment stabilizes the austenite by lowering the M_s and M_f temperatures. This lowering appears to be due to the increase in carbon and alloy content of the austenite with homogenization. Accordingly, an induction-hardened sample with undissolved carbides and carbon concentration gradients may contain more martensite (less retained austenite) than a similar steel quenched after a longer austenitizing treatment. In general, this appears to be true[15, 18]. Furthermore, having less retained austenite, the induction hardened samples should be harder, which they are[16].

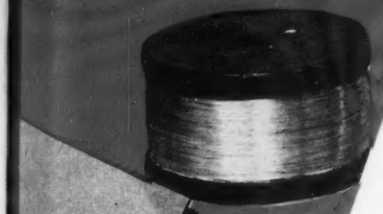
Tempering Martensite: In practice, it is a general rule to temper the hardened steel to increase the toughness and decrease the internal stresses. This is a familiar story to metallurgists and many engineers, but the subject of tempering should be considered because a few exceptions to the general rule occur in induction-hardening applications.

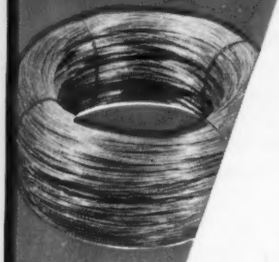
Martensite in steel is a hard, brittle constituent which is undesirable for many applications involving high operating or impact loads. To make the steel more serviceable the part is tempered by heating to a low temperature, 100-500°C, to transform it to tempered martensite or sorbite. These structures are similar and consist of a fine dispersion of carbide in a ferritic matrix, the size of the carbide spheroids increasing with increasing tempering temperature. The tempered structures possess a high degree of hardness, and are tougher than the martensite. In spite of this advantage, it may not be always desirable or necessary to temper surface induction hardened parts. The reason is that the surface layer in such a sample may be in compression, and these internal stresses may act to improve the fatigue strength by partially neutralizing tensile stresses resulting from operating loads. However, there is no rigid rule to follow, and many samples of irregular shapes will require tempering to prevent cracking. Experience is certainly the best guide, and will help in deciding when to temper and when not to temper a hardened sample.

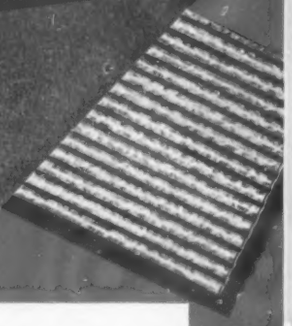
Internal Stresses: Undesirable features of internal stresses, as demonstrated by warpage and cracking, were recognized for a long time. It was only in recent years that the value and significance of

Tops FOR THINGS MADE OF STEEL









Manufacturers are looking more and more to Continental for steel sheets, manufacturer's wire and many other special steel products. Continental Chain Link fence is made of KONIK steel to provide low cost property protection through longer life. Steel sheets and roofing in a wide variety of bases and coatings are made to meet the specific needs of their application. Continental manufacturer's wire is supplied as small as a thread or as large as a bar, in standard and special shapes and in many different finishes and coatings. Nails, staples, and many other steel products round out the Continental line and make it really "Tops" in steel. All Continental products are made from open hearth steel and are uniformly processed and finished according to the needs of their use. Write for your copy of the Manufacturer's Folder today.

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PRODUCERS OF STEEL SHEETS, including Continental GALVANIZED, COPPER-STEEL Galvanized, KONIK steel sheets Galvanized. UNIFORM SPANGLE Galvanized, DULL COAT, Continental GALVANNEALED, ELECTRICAL, Hot Rolled Pickled, and many styles of Formed Roofing. ALSO, Manufacturer's Wire in many sizes, shapes, tempers, and finishes, Continental Chain Link Fence, Nails, and other steel products.

Improved Protection Against Overtravel with new Weight-Operated Limit Stop

No. 10-W Youngstown size; 40 H.P.; 230 volts; d.c. maximum rating.

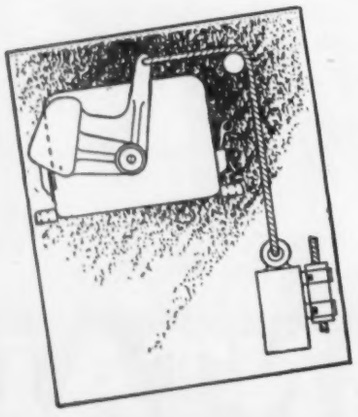
Now, a *weight-operated* Safety Limit Stop for the smaller horsepower crane-hoists. Tripped by *weighted* operating-lever when the danger zone is reached . . . reset *automatically* by suspended *weight* when controller is reversed to lower the hook-block. Other advantages are:

1 No lubrication required—Oilite bearings are self-lubricating and long-lived. This means that the costly and sometimes forgotten item of lubrication-maintenance is eliminated forever.

2 Compact—easy to mount—Small, over-all dimensions—four convenient mounting holes—one suspended weight.

3 Small reset travel—High crane lifts are possible with this new No. 10-W because the amount of travel between "run" and "tripped" positions has been kept at a minimum.

4 High interrupting capacity—Two normally open and two normally closed contacts, mechanically interlocked and with wide, vertical opening, always assure positive interruption of the hoist motor current.



Send for Bulletin 1032 which gives complete details for applying Youngstown Safety Limit Stops to both new and old cranes, either a.c. or d.c.

Optional Style—with offset weighted-arm which eliminates intermediate sheaves when Stop is not mounted directly over crane hook-block. Available on all sizes of EC&M Youngstown Limit Stops.

THE ELECTRIC CONTROLLER & MFG. CO.
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residual internal stresses were understood, although, as pointed out by Almen, the idea of prestressing the surface to improve the properties is as old as steel itself[38]. Purpose of prestressing the surface of a metal part is to induce residual compressive stresses in the surface layer to counteract tension stresses resulting from operating loads, and in that manner improve the fatigue strength and wear resistance. Methods of precompressing the surface of steel are by mechanical deformation, such as rolling or shot peening, or by surface heat treatments, such as carburizing, nitriding or induction hardening.

The metallurgist and the engineer are able to utilize induction hardening to greater advantage if they have a knowledge of the effect of internal stresses on the properties, and recognize that certain safeguards are required to insure full benefits of induction hardening. Significant points will be briefly reviewed in this article, but for those interested in a more detailed account the articles by Horger and his associates[39, 40], Almen[41] and Johnson[42] are highly recommended.

Internal stresses which exist in an induction hardened part result from: Dimensional changes caused by thermal expansion and contraction which normally occurs when the steel is heated and cooled; the phase transformations—alpha to gamma, austenite to martensite, etc.—which may occur during heating and cooling; and plastic deformation which results from the effect of stresses induced by thermal changes and phase transformations.

Stresses in the part may be tensile or compressive, depending upon the history and treatment of the steel, and may be beneficial or detrimental depending upon their magnitude and location. They are beneficial if they improve the service life, and detrimental if they cause cracks to form, or lower the properties.

Type of stress pattern obtained in the hardened part will depend upon the martensitic case depth, the temperature gradient in the part during the martensitic transformation, and the properties of the steel in the various structural conditions (austenitic, pearlitic, etc.). In a surface induction-hardened bar the martensite in the hardened zone is prevented from expanding to its full volume because of the restraining influence of the attached, unhardened core. The result of this condition is that the case is in compression, and the core in tension. A simple demonstration of the presence of internal compressive stresses in such a sample is obtained by cutting the bar either transversely or longitudinally. Cutting of the hardened case allows the martensite to expand sufficiently to grip the cut-off wheel. Frequently, the

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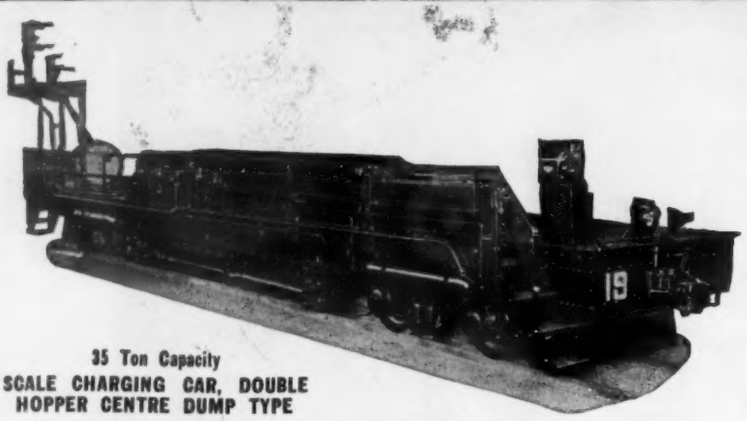

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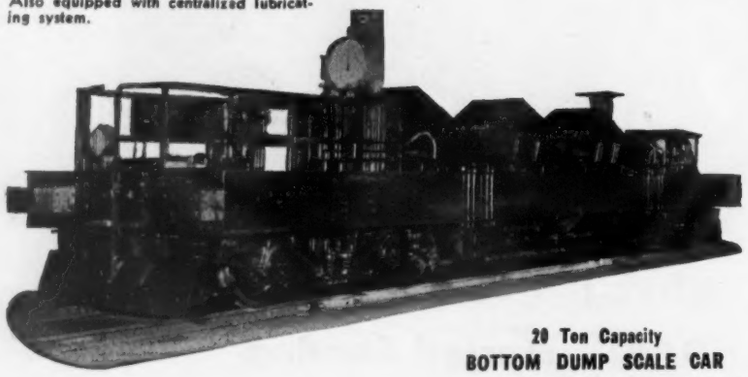

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stresses are high enough to stop a high-speed cutting wheel.

Since fatigue failures occur in conjunction with tensile failures, it is possible to partially neutralize tensile stresses which result from external loads by placing the surface in compression and thus improve the fatigue strength of the part. Unfortunately, surface induction hardening does not always result in improved fatigue properties. The so-called heat-affected zone where the steel was heated close to but below the critical temperature is a tension-stressed zone which may promote an internal fatigue failure of the part, or a surface failure if the second zone extends to the surface, as at the end of a localized hardened zone. Almen[41] and Johnson[42] discuss the dangers associated with the harmful second zone, and show that induction hardening may lower the fatigue strength unless precautions are taken. The problem is, first, one of designing the dimensions of the hardened zone so that the second-zone will not impair fatigue properties, and second, of proper selection of equipment and material to enable the heat-treater to obtain the specified case dimensions.

A corrective measure to minimize or eliminate the damaging effect of the heat-affected zone is to shot-peen the surface after induction hardening. Johnson demonstrated the value of this treatment in improving the fatigue strength of a cylindrical specimen with an oil hole[42]. Shot peening should be of particular value where localized areas are hardened and the second zone is exposed to the surface. However, it constitutes an additional operation and will not likely be used, unless required, because of the extra cost.

The idea of designing for induction hardening is not new. Curtis discussed the practical value of designing the part with the object of facilitating the hardening operations[8] and Johnson emphasized the aspect of designing the dimensions and location of the hardened case to improve the service properties[42]. Both types of design are important. It also is evident that many organizations are giving more attention to each with the object of increasing production and improving the service life. The available information on how to design to accomplish these aims is meager, so that definite procedures can not be established. However, general problems of design should be remembered to act as a guide in applying induction hardening to highly stressed machine parts.

Quenching Cracks: Surface of a hardened part is in compression only if the sample is surface hardened. If the part or section is hardened completely through, the stress pattern is different. Instead of the surface being in com-

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pression, it is likely to be in tension. The reason for the reversal in internal stress pattern is that the austenite in the center transforms to martensite after the outside layer has transformed. As a result, the coremartensite is prevented by the restraining surface shell from expanding to its full volume. This results in the core being in compression and the surface in tension. The residual tensile stresses in the surface are detrimental because they lower the fatigue strength, and frequently cause cracking. Two examples of cracking in high carbon steels are shown in Fig. 45. Sample (a) illustrates spalling or chipping of the edges, and (b) shows a severe condition where the 1-in. diameter cylinder split into four parts.

In induction hardening of gears, the teeth may crack when they are hardened completely through. Even if cracks do not form, the tensile stresses at the surface may impair the fatigue strength, and consequently, tempering to relieve the stresses is recommended.

To prevent formation of quenching cracks it is necessary that the center of the section transform to martensite at about the same time the austenite in the surface transforms. This is possible by an interrupted quench near the M_s temperature (370° C for a 1050 steel) which permits equalization of the temperature gradient between surface and core. On cooling slowly in air to room temperature from the interrupted quenching temperature, the surface and the core austenite, being at nearly equal temperatures, will have almost equal quantities of martensite at every instance. Therfore the damaging stress gradients which cause cracking will not be established. If the induction samples crack during quenching it may be of value to interrupt the water quench when the surface has reachd the M_s-point to allow for temperature equalization. Another method of decreasing the temperature gradient (and still obtain martensite) is to use oil quenching.

In some instances it is possible to prevent cracking by substitution of one steel for another. Alloy steels and high carbon steels are, in general, more susceptible to cracking than medium, plain carbon steels. Therefore, it may be possible to substitute a 1050-type steel for one which may be more susceptible to cracking.

(*To be continued*)

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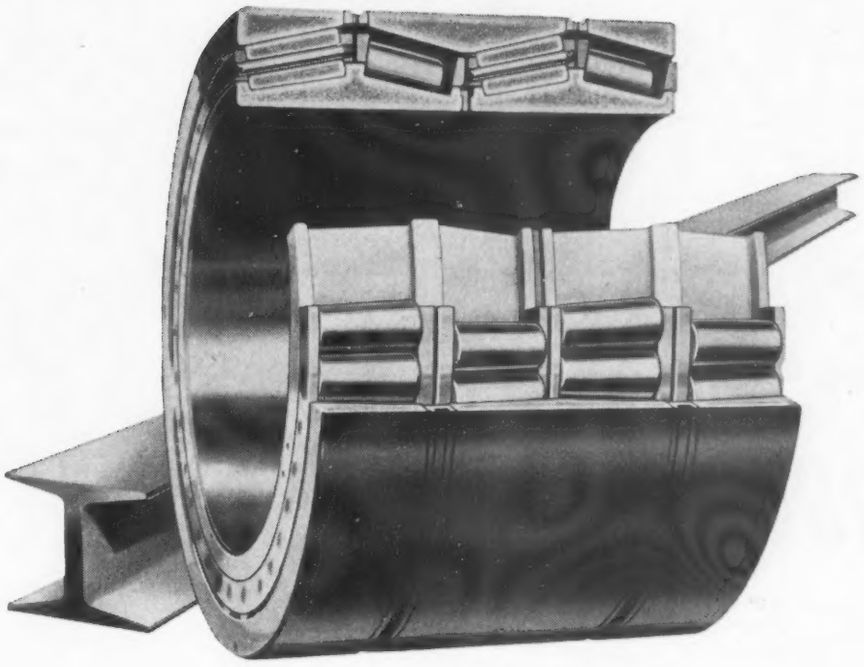

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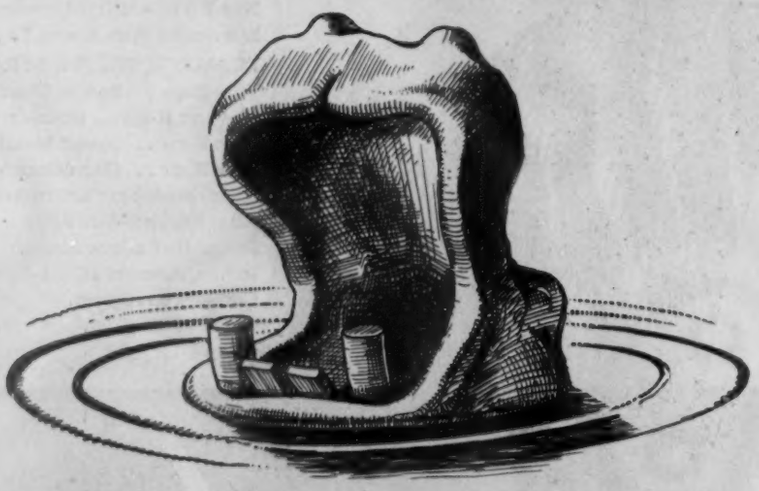

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(*Concluded from Page* 108)

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(*Concluded from Page* 110)

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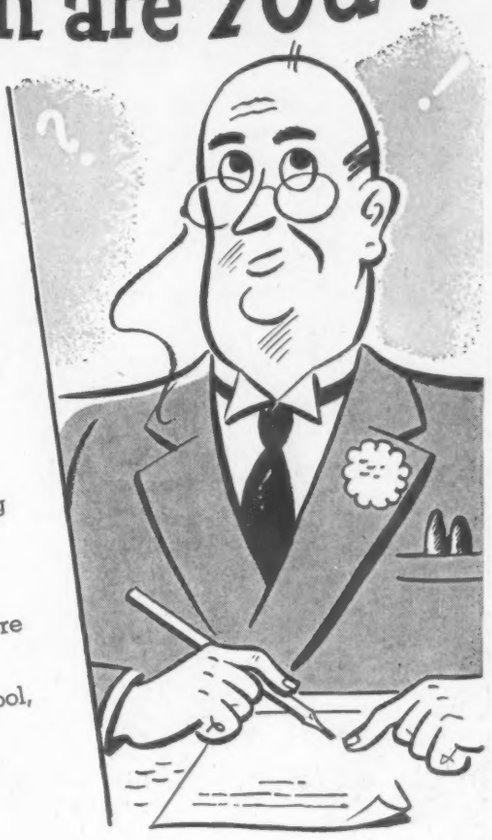

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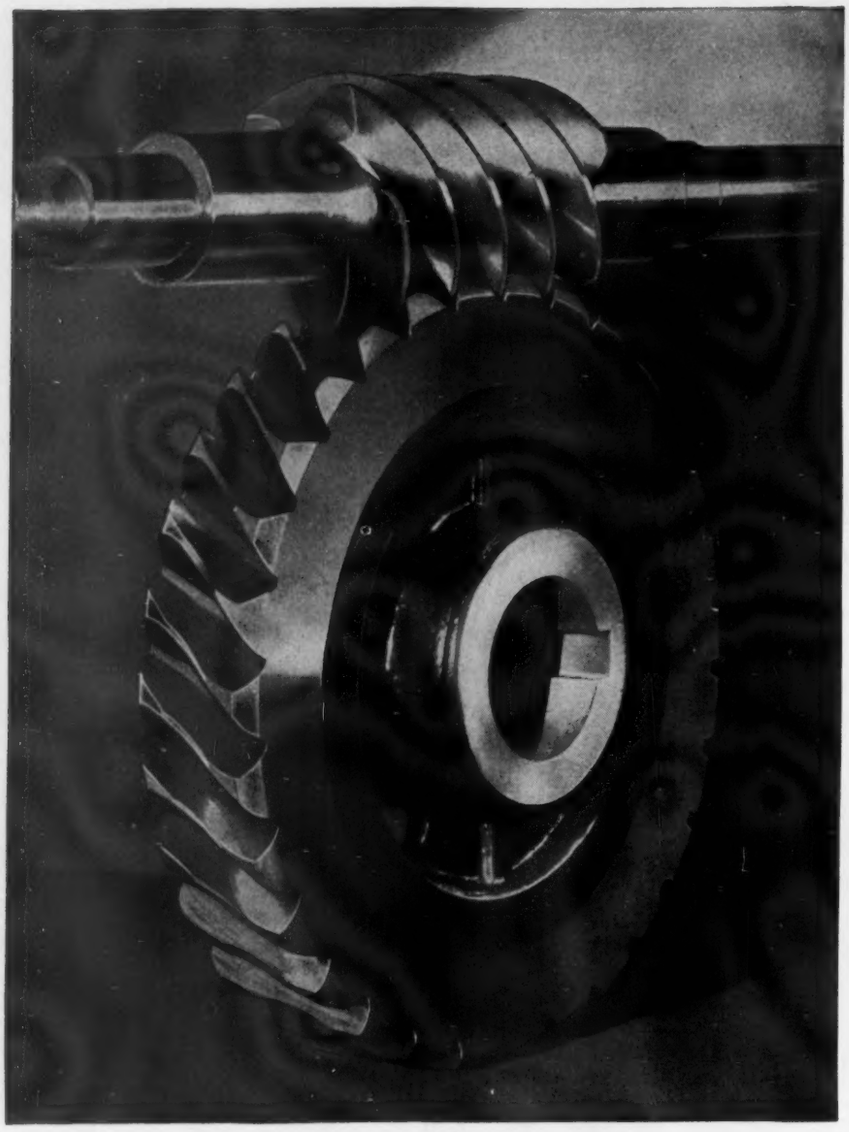

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Standard on Tool Life

(*Continued from Page* 116)

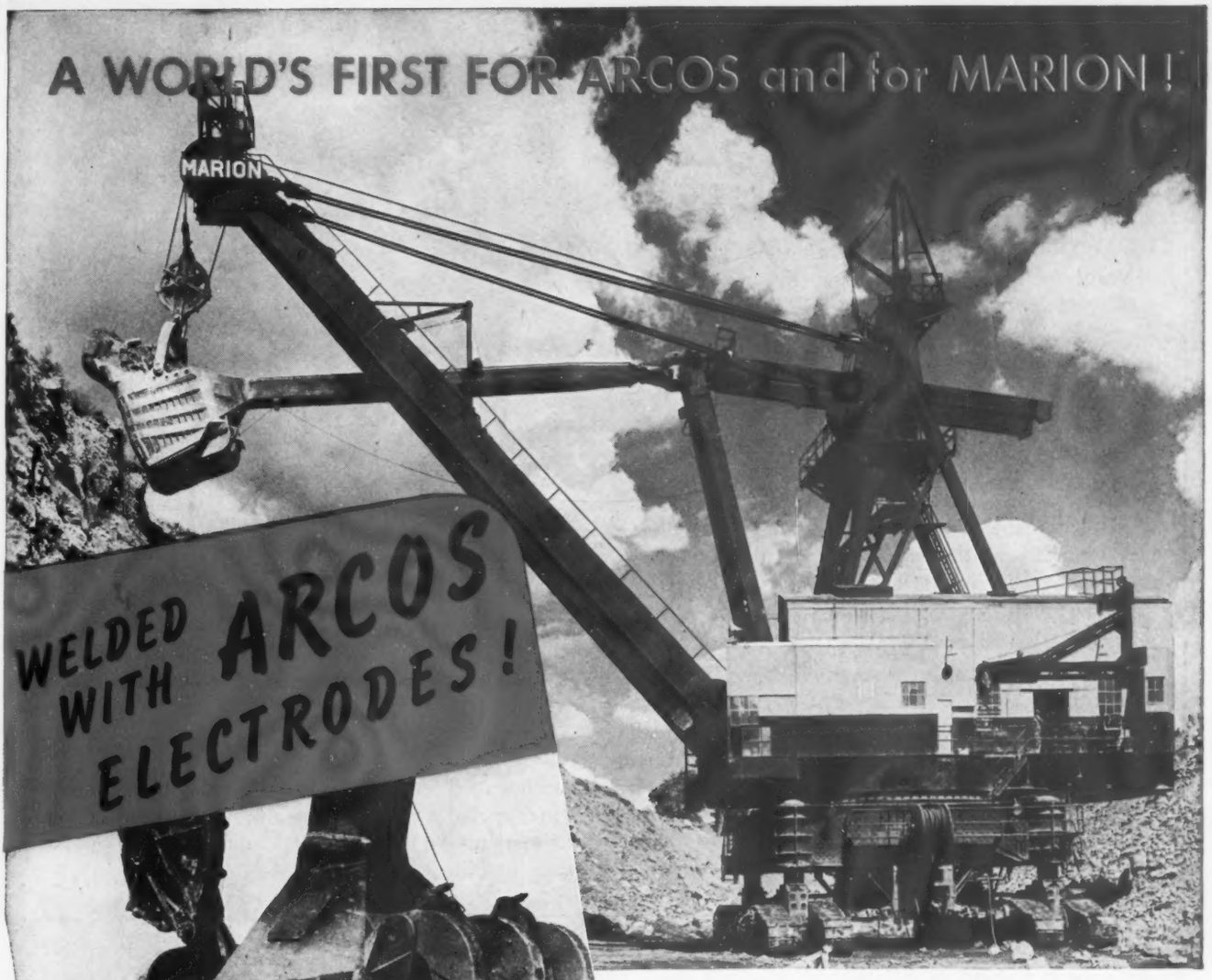
affect finish only on the shoulder left by the chip removal. Preliminary failure is evident by the appearance on this shoulder of a narrow, highly-burnished band. If the cut is continued, the band will keep changing, usually getting larger until the time of complete tool failure when the shoulder is completely burnished and the intersection of the shoulder with the cylindrical machined surface is joined by a fillet of suddenly increasing radius. This complete failure occurs in a fraction of a second.

Preliminary failure may occur after the tool has been cutting for a part of its total life. It may occur after 50 per cent or 75 per cent or even 95 per cent of its total tool life, depending upon the particular tool material, tool shape, size of cut, etc. If the time of preliminary failure is recorded along with that for total failure and the points plotted on log-log paper similar to those of total failure in Fig. 4, a second line will be obtained somewhat lower for the preliminary failure points than for the final failure points, which may be parallel to the ultimate failure line or making a small angle with it, showing either increased or less slope. For some tests this line, based on preliminary-failure life, may be used in evaluating tools, materials, as well as in evaluating cutting fluids.

For a given set of test conditions, preliminary failure may be found to give ratings closer to the practical results than final failure. This may be true, particularly in screw machine work where the shape of the work controls the shape of the tool as, for example, where a sharp shoulder is desired, or in finishing cuts where uniform surface quality is important.

When a tool fails by abrasion on the flank below the cutting edge, it is usually difficult to observe progressive wear. Its presence is noted on the surface quality or on the shoulder. However, if flank wear occurs on the tool end, the diameter of the work will be increased in proportion and the surface finish will appear more burnished. If it occurs on the shoulder, the surface quality of the shoulder will become more burnished as the tool cuts with zero relief. This condition continues until sufficient heat is generated to cause the tool to fail suddenly.

In applying the data obtained from preliminary or final failures to practical shop work, a tool life should be selected somewhat less than that at which preliminary failure occurs so that the tools may be removed from the machine and reground by touching up. This removes less tool material than by regrinding after


A WORLD'S FIRST FOR ARCOS and for MARION!
MARION
WELDED WITH ARCOS ELECTRODES!
TO WELD THIS DIPPER required
3,000 pounds of Arcos Chromend 29/9
(Type 312) electrodes (this was 95% of this grade used)
1,300 pounds of Arcos Manganend
2M electrodes (this was 100% of this grade used)
Chromend 29/9—for welding wear resisting, high manganese steel to itself or to low alloy high tensile steels
Manganend 2M—for welding low alloy high tensile steels

Dipper capacity, 40 cubic yards. 35,000 pounds saved by ability to weld low alloy high tensile steels.

IT MEANT LIVING WITH THE JOB

For fifteen months the Research and Field Engineering facilities of Arcos worked diligently with Marion to weld this "first of its kind" alloy job. Electrode recommendations made by Arcos were followed; the techniques of welding developed by Arcos were employed—

Arcos shares with Marion their pride in this accomplishment. Arcos is again "showing the way".

ARCOS

ARCOS CORPORATION • 318 GULF BUILDING, PHILA. 2, PA.

ZONE FORMATION In Galvanized Steel

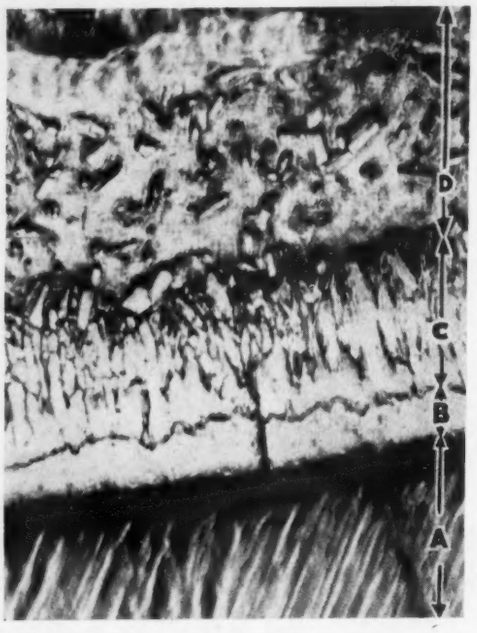
VARIOUS zones that may form during hot dip galvanizing are shown in the accompanying photomicrograph which was taken by Dr. W. R. Meyer, technical director, Enthone Inc., New Haven, Conn.

Zone A is the base metal. Zone B is the extremely brittle Fe_3Zn_{10} zone. Every effort should be made in hot galvanizing to minimize the thickness of this zone. A crack may be noted near the right center of the photomicrograph extending through this zone and into the next. When the Fe_3Zn_{10} zone is very thick due to too long immersion in the molten zinc, shatter cracks may form through the entire zone, and the hot galvanized coatings will have little adhesion.

Zone C consists of a definite structure, usually columnar, designated as $FeZn_7$.

Zone D consists of a free-zinc which may have dispersed throughout $FeZn_7$ platelets. The free-zinc zone which contains a very small amount of iron in solid solution, frequently may be entirely absent if asbestos wiping of the coating may be done, or if the coating be subjected to a strong blast of air.

Best hot galvanizing coatings are those which contain almost no visible iron-zinc alloy zones. Poor pickling or cleaning of the base steel may be responsible for excessive alloy formation due to the need of long immersion time in the molten zinc to penetrate through scale or dirt.



Cross section photomicrograph of a hot galvanized coating 500x

total failure. These practical cutting times should, however, be based on the time of preliminary or total failure.

During the machining of abrasive, short-chip materials, such as cast iron, which cause the tools to fail by flank abrasion, tool life based on a specified amount of flank wear, such as 0.020-in., may be used as a method of determining tool failure and of deciding when the tool should be reground.

A Typical Test: In Fig. 4 are shown the results of cutting speed tool-life tests on two die steels, both heat-treated and tempered to give a brinell hardness of 363. The material was furnished as forgings 6 in. in diameter and 20 in. long. Two different sizes of cut were used when turning dry. One cut was a finishing cut of 0.0125-in. depth and 0.0127-in. feed. The second was a heavier cut of 0.100-in. depth and 0.0127-in. feed. High-speed-steel tools of 18-4-1 type (known as Red Cut Superior) were used. These tool bits were held in a solid steel tool holder 1½-in. wide, 2½-in. deep, and 4 in. long by one set screw on the top. The tool-holder angle was 10½ degrees and setting angle was 90 degrees. The tool point was ground to have working angles of 8, 14, 6, 6, 6, 15, 3/64. The tool bits were ⅜-in. square.

A sample data sheet is shown in accompanying table. Values of cutting-speed tool-life are plotted in Fig. 4. The comparative results are shown as a table in Fig. 4. For the light cut, both steels give the same data, i.e., the same slope n of 0.08 and the same value of C of 181. This means that both lines have the same slope and pass through the same point, therefore the machinability based on cutting-speed tool-life under these conditions is identical and values of V_{10}, V_{30}, and T_{150} are equal. For the heavy cut, the slope as represented by n is 0.11, indicating these lines to be steeper than those for the light cuts. This is disadvantageous. The value of C for steel A is 84, while that for B is only 78 fpm. The former is 6 fpm or 7.7 per cent higher. V_{10} for A as 65.5 and for B is 61. The former is 4.5 fpm, or 7.4 per cent higher. For the light cut, the value of T_{150} is 12 for both steels. For the heavy cut T_{60} is 11.5 min for steel A and 25 min for B. The latter is 117 per cent greater.

These results show that the two steels machine equally well, and favorably with the low slope, at light cuts, but that steel A machines better than B at the heavy cuts. In this same manner, keeping the cutting fluid and material constant, the cutting tools of different shape or material may be evaluated.

From *Industrial Standardization*, published by American Standards Assoc., New York.

New Potentiometer Suited For Redesigned Equipment

Line of wire-wound linear potentiometers developed by Fairchild Camera & Instrument Corp., Jamaica, N. Y., lends itself readily to design and production simplification of many kinds of electrical equipment.

Consisting of three models, line is said to give high performance accuracies. For plotted performance, accuracies of 0.05 per cent are provided in the largest, 5-in. diameter size, and 0.15 per cent in the smallest, 2-in. size.

Life of models is longer, as they provide more than 1,000,000 cycles of operation while retaining initial accuracy. Electrical angle of rotation is from 352 to 357 degrees, leaving a maximum unwound sector of 8 degrees in the smallest size and an unwound sector of 3 degrees where maximum wound length is required.

The potentiometers are suited for general applications in simplifying circuit designs for precise control.

German Metal Research Papers Made Available

Standards for steel and aluminum alloys used in German aircraft are included in the 636-page microfilmed collection of German metallurgical research papers available from Office of Technical Services, Department of Commerce, Washington. The collection, which is in German, includes research studies, technical papers, photographs, drawings and tables from Messerschmitt plants in Oberammergau and Garmisch-Partenkirchen, some dating back to 1936.

Among subjects covered are creep behavior of aluminum alloys and heat resistant iron materials at high temperatures, standards and applications of various steels used in aircraft, endurance of nonwelded and welded chromium-molybdenum steel tubes under stress and experiments on the metal-arc welding of thin sheets of chromium-molybdenum steel. Copies of the report, PB-2428, are offered at $43 for the photostat edition or $6.50 for the microfilm edition.

Helps Engineers To Specify Right Valve

Bronze, iron and steel valves are covered in a new catalog published recently by Ohio Injector Co., Wadsworth, O., to aid engineers, production men and purchasing agents in selecting the right valve for the job. Illustrated with outside and cross sectional wash drawings, the 248-page compilation contains alphabetical and numerical indexes of all valves listed as well as telegraph codes.

Besides analyzing materials used in the valves, the publication points out working and testing pressures for each type of valve, a description and data pertaining to a particular valve, along with service recommendations. Sections are devoted to valve accessories and parts, thermodynamic properties of steam, circumferences and areas of circles, metric and English equivalent measures, temperature conversion and decimal and metric equivalents. Prices and general dimensions are listed with each type of valve.

—o—

Many questions concerning lock nuts are answered in the booklet recently issued by National Screw & Mfg. Co., Cleveland. Included are descriptions of the various types of fasteners manufactured by the company, as well as application information, price lists, specifications, advantages and a section on calculating wrench torques. It includes numerous line drawings and photographs illustrating principles and applications.

PAGE *Stainless Steel* WIRE

● It isn't boasting to say that we really know something about stainless steel wire. Wire has always been the business of PAGE. And stainless steel wire has been a PAGE specialty almost since the introduction of stainless.

PAGE offers you a responsible source for wire and information about its use in production. High and low carbon steel, Armco iron as well as various analyses of stainless. Get in touch with PAGE.

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

CONTINUOUS *Seam Welding*

Maximum speed of 250 in. per minute maintained for several hours using automatic fixture. Rounds, squares and other shapes move continuously under stationary welding head

WARTIME pressure for 75 and 105 mm shell containers created a fixture that is being adapted to peace-time seam welding of rounds, squares and other shapes of tubes and tanks. In the new fixture, welding head remains stationary while work moves continuously under it. This is a departure from the idea of clamping work in a fixture and then moving the welding head along the seam, breaking the weld, unclamping the old work, clamping the new and repeating.

On the automatic seam welding fixture built by Victory Engineering & Machine Works Inc., St. Louis, open butted edge tubes, preformed to a uniform shape are fed one after the other onto the machine. Tubes pass automatically through the fixture, closing up any gap between pieces. Butted edges are closed tight while passing under the Lincoln welding head and off the water-cooled mandrel.

As shown in the accompanying photograph, one operator places the pieces on at the feed end, and another operator lifts to break apart and remove finished pieces at the discharge end. In production, no time is lost in loading work because the weld is carried on from one piece to the next without interruption.

Tolerance of finished work depends upon the dimensions of the shell formed since the two edges of the seam are butted tightly together without changing the dimensions of the circumference. Seam welder has a variable speed range of 60 to 150 in. weld per minute, with reversing and inching controls that can be altered while the work is in motion. After a run of any diameter size, adjustments to any other size can be made in less than half an hour.

One model has a continuous micrometer size adjustment from 4 to 12 in., while two others can be set from 12 to 24 in. and from 24 to 36 in. respectively. Above models can be regulated for wall thicknesses from 18-gage to 3/16-in. Special models can be designed for production jobs limited to one diameter.

In addition to rounds, fixtures can be furnished to handle square tubes with a corner or side weld, also odd shapes of rectangular, triangular, many-sided or kidney shaped, ovals and others.

While in actual operation short lengths are fed without interruption in a continuous line, it is conceivable that a straight tube of indefinite length could be continuously welded, provided the necessary conveyor system is arranged at each end of the fixture.

Hourly production depends on a few easily predicted variables, and can be estimated with reasonable accuracy. Eliminating labor interruptions and allowing a safety factor of 25 per cent to cover other contingencies, speed of weld is primarily dependent on thickness of metal being welded; the thicker the gage the slower the weld. Allowing for the above factors which affect average rates, continuous welds of the speeds mentioned are easily maintained. In one case a maximum speed of 250 in. per min. was reached and held for several hours—on furniture type nonpressure-proof square tube weld.

Chain type drive of the fixture allows practically continuous line contact with work. This enables very short lengths to be run as well as long ones. While gripping of the line contact is powerful and positive, it does not leave gripping marks of the fluted drive rolls. Use of the fixture is said to have been very successful with short thick tubes.

Self-Hardening Electrode Is Extrusion Coated

A self-hardening electrode which is extrusion coated for strength and has less tendency to pick up moisture, is offered by Stoody Co., Whittier, Calif., manufacturers, and Air Reduction Sales Co., New York 17, distributors. Having excellent working characteristics with either alternating or direct current, the electrode is also said to have no slag interference and provides more rapid deposition without loss of hardness.

Typical applications given include hard facing in building up worn areas of tractor lugs, manganese steel crushing equipment, wobblers, spindles, coupling boxes, etc.

Latest Fastener Testing Procedure Published

A 16-page booklet describing a procedure for testing the locking effectiveness of self-locking nuts and related fastening devices is offered by Elastic Stop Nut Corp. of America, Union, N. J. N. J.

Prepared by Dr. J. A. Sauer, head of department of engineering mechanics of Pennsylvania State college, the booklet describes equipment and procedures for making tests for vibration, installation and removal torque, re-use torque, and wearing and plating. Evaluation of these tests in connection with individual fastener problems is also covered.

—o—

First of a series of informative booklets on wire rope is "Correct Handling of Wire Rope", published by Union Wire Rope Corp., Kansas City. Each booklet in this series is designed to serve as a reference manual wherever the product is used. Copies of the booklet may be obtained free of charge by writing the company.

Comparative Floor Data Given in Flooring Book

A new floor covering, Emeri-Crete, contains an aggregate of emery, to which cement and water are added and which is said to be nonskid, nonabsorbent and acid-resistant is described in detail in a booklet issued by its makers, Walter Maguire Co. Inc., New York.

Also included in the booklet are comparative strength analyses of popular flooring materials used in plants and warehouses. Photographs show installations in widely diversified industries.

Railroad Car Insulators Reduce Noise

Designed to withstand millions of flexings under high stress without distorting from their permanent shape, new rubber insulators are said to virtually eliminate noise from railroad passenger cars, according to United States Rubber Co., New York. Known technically as mountings, they are placed between the truck and the body of the car during construction, intercepting noise produced by the wheels on the rails. Several different types and sizes are required for each car, the company states.

New Electrode Offered Resists Abrasion, Impact

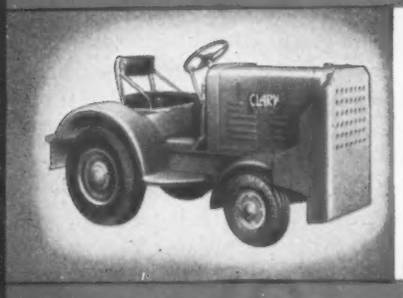
Hard-surfacing, high carbon, chrome, molybdenum, shielded arc electrode that can be deposited on any ferrous metal is announced by American Manganese Steel Division, American Brake Shoe Co., of Chicago Heights, Ill. It is said to be especially suitable for protecting ferrous parts subjected to severe abrasion with or without impact, and produces deposits with a hardness of 400 to 500 brinell. Called Resistwear, electrode is offered in coated form only for alternating and direct current in 1/8, 5/32, 3/16 and 1/4 in. diameters, in 14 in. lengths.

Lists Drill Information

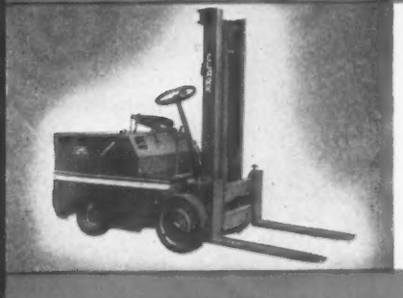
A catalog containing information and data on twist drills, reamers, counterbores, milling cutters, end mills, hobs and other standard and special metal cutting tools has been published by National Twist Drill & Tool Co., Rochester, Mich. Various types of tools are listed in separate sections, located by means of thumb cuts. Each section has its own index with combined index in back of book. Tables and charts on drilling, milling and gears are included in 60-page engineering data section.

Cut Cost Factors with Clark Tructractors

The New CLARKAT



The Famed CLARKTOR 6



Electric FORK TRUCK

Gas Powered FORK TRUCK

ABOVE EVERYTHING ELSE . . . in the material handling field, Clark Methods and Clark Machines are outstanding, permitting maximum savings in man hours and handling costs. The full story in pictures — "Material Handling News" — is yours for the asking.

CLARK TRUCTRACTOR
Division of CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN
OTHER PLANTS — BUCHANAN, JACKSON, BERRIEN SPRINGS, MICHIGAN

Other CLARK Products

FORK LIFT TRUCKS
TOWING, DUMP AND SHOVEL TRACTORS
RAILWAY TRUCKS
DRILLS & GEARS
ELECTRIC STEEL CASTINGS
METAL SPOKE WHEELS
AXLES & HOUSINGS
TRANSMISSIONS

Prices on CLARK products will not be advanced in excess of increased costs.

The Business Trend

Present Industrial Pace Equals Postwar High

AFTER a month-long climb, industrial activity as registered on STEEL's industrial production index is now back to approximately the postwar high mark of 158 per cent of the 1936-1939 average of 100.

Prospects for continuation of the high rate are made encouraging by the peacefulness in current labor contract negotiations.

Latest stimulant to the rising rate was automobile output, which in the week ended Jan. 25 was estimated at 94,345 passenger cars, trucks and busses. This was the greatest production since the third week of December.

STEEL—Another factor in the index, steel ingot production, is now as high as at any time since the end of the war. While this is encouraging, the balancing of supply and demand is still some months in the future.

COAL—High rate of bituminous coal production continues, with a result that output for the first three weeks of this year was 2 per cent ahead of that for the corresponding period of last year. Estimated production in the week ended Jan. 18 was 13,220,000 tons.

ELECTRICITY—The present high rate of industrial activity is making a heavy demand for electric power, with a result that electricity distribution in the first four weeks of 1947 was 18 per cent above that for the corresponding period of last year.

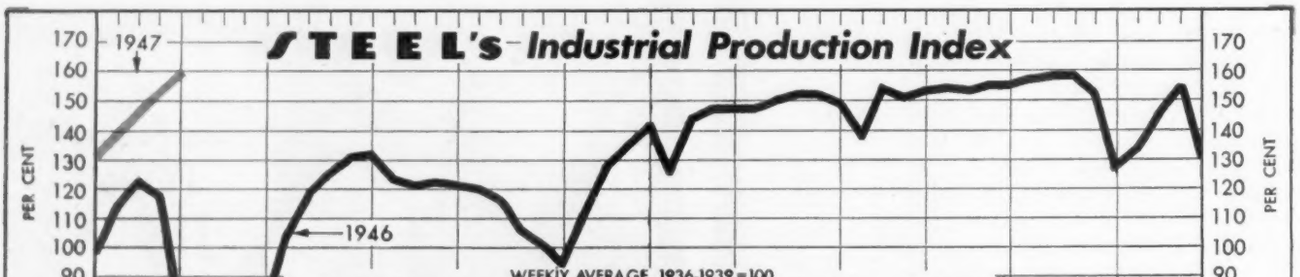
PRICES—With higher prices in all groups except foods, average primary market prices rose 0.6 per cent to a new postwar high during the week ended Jan. 18, the U. S. Bureau of Labor Statistics reported. At 140.8 per cent of the 1926 average of 100, the bureau's index of commodity prices in primary markets was 32 per cent above mid-January, 1946.

RAILROADS—Using advance reports as a basis, the Association of American Railroads estimates that railroad operating revenues in December, 1946, increased 2.7 per cent above the corresponding month in 1945.

STRUCTURAL STEEL—The strangling effect of high costs in the construction field is reflected in a report from the American Institute of Steel Construction showing that new orders placed in December for fabricated structural steel were estimated to total only 96,601 tons, lowest for any month in 1946 and opposite the pattern of 1936-1940 average. Although December shipments declined from November, they were still at a substantial level, being 142,071 tons.

CONSTRUCTION—The month-to-month decline which has been underway since May in dollar volume of construction contracts awarded in the 37 eastern states continued in December, the estimate for that month being $457,278,000, according to F. W. Dodge Corp.

INVENTORIES—Actual and prospective increases in supplies and a growing selectivity among industrial buyers and consumers have led to development of price weakness in some lines, the Federal Reserve Board pointed out in warning businessmen to beware of excess inventories.



The Index (see chart above): **Latest Week (preliminary) 158** **Previous Week 152** **Month Ago 130** **Year Ago 77**

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)†	91.5	91	77	5
Electric Power Distributed (million kilowatt hours)	4,856	4,857	4,442	4,034
Bituminous Coal Production (daily av.—1000 tons)	2,203	2,283	2,183	2,144
Petroleum Production (daily av.—1000 bbls.)	4,672	4,624	4,713	4,626
Construction Volume (ENR—Unit $1,000,000)	$73.9	$110.2	$34.3	$101.4
Automobile and Truck Output (Ward's—number units)	94,345	75,166	67,070	29,410

* Dates on request. † 1946 weekly capacity was 1,762,381 net tons.

TRADE				
Freight Carloadings (unit—1000 cars)	850†	828	628	709
Business Failures (Dun & Bradstreet, number)	52	51	38	24
Money in Circulation (in millions of dollars)‡	$28,369	$28,518	$29,163	$27,977
Department Store Sales (change from like week a year ago)‡	+17%	+24%	+26%	+19%

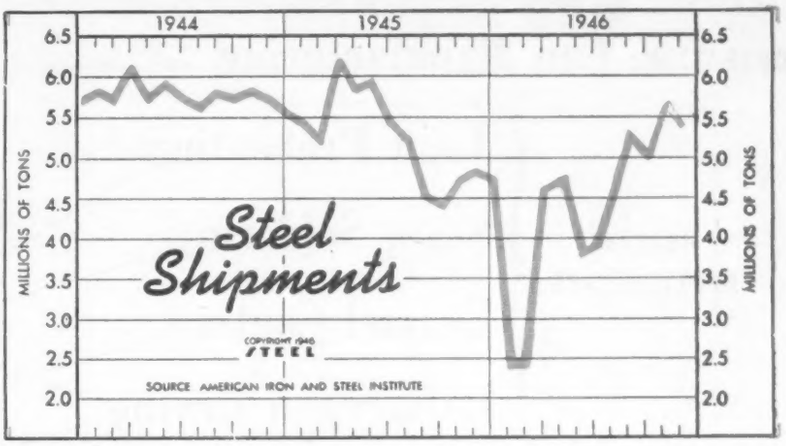
† Preliminary. ‡ Federal Reserve Board.

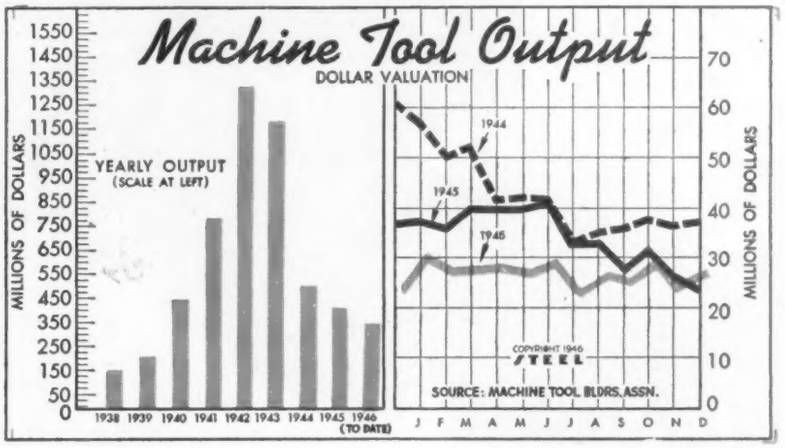
Steel Shipments

(Net Tons)

	1946	1945	1944
Jan.	2,391,850*	5,435,647	5,767,687
Feb.	2,391,849*	5,184,498	5,700,673
Mar.	4,644,988	6,179,452	6,146,595
Apr.	4,698,081	5,769,786	5,744,177
May	3,906,064	5,938,055	5,859,786
June	3,966,628	5,437,206	5,703,314
July	4,639,610	5,214,074	5,597,631
Aug.	5,406,470	4,512,637	5,837,328
Sept.	4,994,377	4,391,143	5,743,437
Oct.	5,675,339	4,660,237	5,752,147
Nov.	5,404,498	4,779,628	5,686,527
Dec.	.....	4,729,561	5,458,133

* Figures for January and February, 1946, are merely averages derived from a report that combined shipments for those two strike-affected months into a total of 4,783,699 tons.




Machine Tool Output
DOLLAR VALUATION
YEARLY OUTPUT (SCALE AT LEFT)
MILLIONS OF DOLLARS
1944
1945
1946
COPYRIGHT 1946 STEEL
SOURCE: MACHINE TOOL BLDRS. ASSN.
1938 1939 1940 1941 1942 1943 1944 1945 1946 (TO DATE)
J F M A M J J A S O N D

Machine Tool Shipments

(000 omitted)

	1946	1945	1944	1943
Jan.	$30,263	$37,353	$56,363	$117,384
Feb.	26,949	36,018	50,138	114,594
Mar.	27,326	40,045	51,907	125,445
Apr.	28,108	40,170	41,370	118,024
May	26,580	39,825	41,819	113,859
June	28,580	41,040	41,471	108,736
July	22,360	32,504	32,753	97,541
Aug.	26,911	32,500	35,177	87,805
Sept.	25,468	27,300	35,889	85,842
Oct.	29,140	31,200	37,516	78,302
Nov.	26,176	26,000	36,277	71,811
Dec.	27,587	28,200	36,784	60,873
Total	$325,448	$407,155	$497,464	$1,180,216

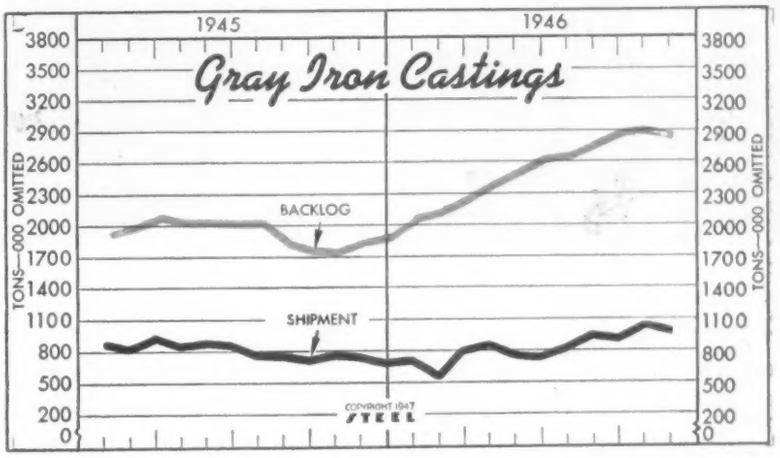
Gray Iron Castings

(U. S. Bureau of Census)

Tons—000 omitted

	Shipments 1946	Shipments 1945	Backlogs* 1946	Backlogs* 1945
Jan.	706	862	2,077	1,922
Feb.	541	816	2,153	1,998
Mar.	796	928	2,265	2,089
Apr.	857	843	2,378	2,032
May	757	867	2,492	2,031
June	735	849	2,633	2,016
July	811	749	2,669	2,015
Aug.	945	750	2,786	1,818
Sept.	914	718	2,882	1,755
Oct.	1,051	767	2,916	1,742
Nov.	964	751	2,888	1,847
Dec.	....	678	....	1,877
Mo. Ave.	....	798	....	1,928

* Unfilled orders for sale to the trade.



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$13,093	$12,105	$12,782	$12,552
Federal Gross Debt (billions)	$259.7	$259.5	$262.6	$278.6
Bond Volume, NYSE (millions)	$22.2	$26.7	$21.0	$35.3
Stocks Sales, NYSE (thousands)	4,426	5,896	5,120	10,142
Loans and Investments (billions)†	$56.1	$55.6	$56.9	$68.2
United States Gov't. Obligations Held (millions)†	$36,231	$35,802	$36,559	$49,629

† Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$69.36	$69.36	$64.91	$58.27
All Commodities†	140.8	140.0	139.8	106.7
Industrial Raw Materials†	153.3	153.1	155.5	118.7
Manufactured Products	136.4	135.4	134.2	102.9

† Bureau of Labor Statistics Index, 1926=100.

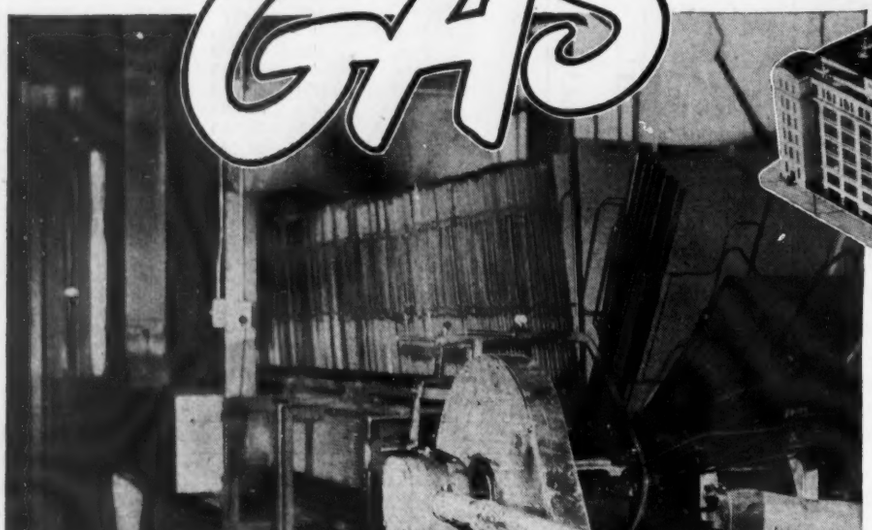
OPERATION: Can Manufacturing

HEATING APPLICATIONS:

- Joint Preheating
- Seam Soldering
- Enamel Coating
- Lithograph Drying

FUEL: GAS

American Can Company Plant, Brooklyn, N. Y.



Enamel-coated tinplate emerging from drying oven

The productive flames of GAS perform essential functions in the manufacture of cans for the foods and beverages packaged by the giant canning industry.

American Can Company's trademark is a familiar sight on the grocery shelf because so many of the best foods are preserved in CANCO cans. As a leading producer, American Can Company has developed streamlined equipment in which heat is a production tool and the heat source is GAS, the invariable choice of design engineers who require fuel flexibility.

For lithograph ovens where uniform temperatures are essential to maintain color tones, in body-making machines where the joint-seal requires pre-heating and solder-melting, in the tunnel ovens for enamel-drying, the remarkably precise controllability of modern GAS equipment is amply evident.

Labor-saving automatic controls, clean and pleasant working conditions, availability and dependability of supply make GAS the preferred fuel for all process heating. Your local Gas Company will recommend methods for applying GAS to your industrial processes.

MORE AND MORE... THE TREND IS TO GAS FOR ALL INDUSTRIAL HEATING

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

Steel Ingot Production Rises To Highest Rate Since 1945

Producers confident they will be able to maintain output at high rate for some months to come, now that labor outlook has brightened. Price revisions continue to be made

STEEL ingot production increased to a new postwar high last week, the estimated national operating rate advancing one point to 92.5 per cent of rated capacity. This was the highest rate attained since May, 1945. Extension of the present wage agreement with the steelworkers' union until Apr. 30 assures producers of the largest peacetime first quarter output in history and will afford them an opportunity to reduce their large volume of unfilled business.

While a shortage of raw materials still prevails, notably in pig iron and scrap, steel producers nevertheless are confident they will be able to maintain production at a high rate for some months to come, now that the labor outlook has brightened considerably. Given six months of uninterrupted output, they believe they will be able to do much toward bringing supply and demand into balance on most products. However, there will be a continued stringency in light flat-rolled products until well into next year, on the basis of present prospects.

Reflecting pressure for raw materials, prices on scrap are stronger, especially in the eastern districts where Pittsburgh mills are competing actively for material. One eastern pig iron producer has advanced prices on all grades $3 a ton, following an increase of $2 a ton late last year. High silicon silvery pig iron has been increased $2 per ton. An advance of one cent a pound in electrolytic copper by a leading producer was not followed last week by other major interests, the market being quoted at a range of 19.50c to 20.50c, Connecticut valley.

While base prices for finished steel products held unchanged last week, there were several important developments in the market pricewise. New arbitrary delivered prices were established for Detroit and eastern Michigan, the differentials now being 15 and 20 points, respectively, over principal basing point prices. A leading producer of cold-rolled strip issued a new schedule of extras while another producer issued a new classification of all flat rolled products by sizes and revised its schedule of extras.

Plate producers are adjusting future schedules so as to provide more tonnage for railroad car builders. While details have not yet been announced, it appears that some increases in car tonnage will become effective as early as March, with a view to permitting an increase in the output of freight cars to at least 7000 units monthly as soon as possible. Certain producers, selling on a quarterly basis, have been holding up on establishment of quotas for the second quarter until the situation with respect to car tonnage becomes clarified. Indications late last week were that most details had been ironed out, with a result that early action on general sales quotas for next quarter should be expected soon.

Meanwhile, some producers, who all along have been accepting tonnage for shipment well into the future, estimate that with the additional car steel load now contemplated, they will have no capacity left for acceptance of tonnage before the fourth quarter, and at least one declares he is now out of the market for the entire year.

STEEL's composite market average for scrap rose to $31.33 from $31.17 per ton while those for finished steel held at $69.36, for semifinished steel at $52.10, and for steelmaking pig iron at $29.56.

Steelmaking operations rose one point to 92.5 per cent as production increased three points to 95 per cent in Cleveland, two points at Detroit and in New England to 92 per cent and 84 per cent, respectively, one and one-half points at Pittsburgh and St. Louis to 100.5 per cent and 62 per cent, respectively, and one point in eastern Pennsylvania to 88 per cent. Operations at other leading producing points held unchanged.

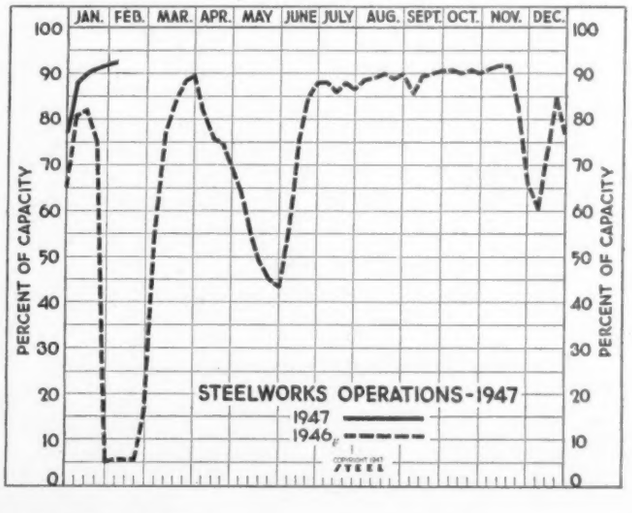
DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged

DISTRICT STEEL RATES in Leading Districts

	Week Ended Feb. 1	Change	Same Week 1946	Same Week 1945
Pittsburgh	100.5	+ 1.5	1.5	87.5
Chicago	90	None	5	99.5
Eastern Pa.	88	+ 1	4	93
Youngstown	88	None	0	80
Wheeling	89	None	56	97.5
Cleveland	95	+ 3	0	79.5
Buffalo	90.5	None	0	43
Birmingham	99	None	0	95
New England	84	+ 2	10	94
Cincinnati	91	None	44	95
St. Louis	62	+ 1.5	19	75
Detroit	92	+ 2	32	87
Estimated national rate	92.5	+ 1	5.5	91

Based on weekly steelmaking capacity of 1,762,381 net tons for 1946; 1,831,636 tons for 1945; 1,791,287 tons for 1944.



COMPOSITE MARKET AVERAGES

	Feb. 1	Jan. 25	Jan. 18	One Month Ago Jan., 1947	Three Months Ago Nov., 1946	One Year Ago Feb., 1946	Five Year Ago Feb., 1942
Finished Steel	$69.36	$69.36	$69.36	$69.11	$64.45	$60.91	$56.73
Semifinished Steel	52.10	52.10	52.10	49.20	40.60	39.20	36.00
Steelmaking Pig Iron	29.56	29.56	29.56	29.56	27.50	24.75	23.00
Steelmaking Scrap	31.17	31.17	31.17	31.17	22.22	19.17	19.17

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished material (except tin plate) and wire rods, cents per lb; coke, dollars per net ton; others, dollars per gross ton.

Finished Material

	Feb. 1, 1947	Jan., 1947	Nov., 1946	Feb., 1946
Steel bars, Pittsburgh	2.60c	2.60c	2.50c	2.375c
Steel bars, Philadelphia	2.98	2.98	2.86	2.695
Steel bars, Chicago	2.60	2.60	2.50	2.375
Shapes, Pittsburgh	2.50	2.462	2.35	2.225
Shapes, Philadelphia	2.64	2.602	2.48	2.340
Shapes, Chicago	2.50	2.462	2.35	2.225
Plates, Pittsburgh	2.65	2.612	2.50	2.375
Plates, Philadelphia	2.85	2.777	2.558	2.425
Plates, Chicago	2.65	2.612	2.50	2.375
Sheets, hot-rolled, Pittsburgh	2.50	2.50	2.425	2.3125
Sheets, cold-rolled, Pittsburgh	3.20	3.20	3.275	3.1625
Sheets, No. 10 galv., Pittsburgh	3.55	3.55	†4.05	†3.875
Sheets, hot-rolled, Gary	2.50	2.50	†2.425	†2.3125
Sheets, cold-rolled, Gary	3.20	3.20	3.275	3.165
Sheets, No. 10 galv., Gary	3.55	3.55	†4.05	†3.875
Hot-rolled strip, Pittsburgh	2.50	2.50	2.35	2.225
Cold-rolled strip, Pittsburgh	3.20	3.20	3.05	2.925
Bright basic, bess, wire, Pittsburgh	3.425	3.420	3.05	2.90
Wire nails, Pittsburgh	4.125	4.062	3.75	3.075
Tin plate, per base box, Pittsburgh	$5.75	$5.75	*$5.25	*$5.125

* Nominal. † Base changed in December to 10 gage.

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$58.00	$52.25	$38.00	$37.00
Slabs, Pittsburgh, Chicago	51.00	48.00	39.00	37.50
Rerolling billets, Pittsburgh	51.00	48.00	39.00	37.50
Wire rods ¼ to 5/16-inch, Pitts.	2.675c	2.675c	†2.30c	2.225c

† Base changed in December from 24 gage to 10 gage.

Pig Iron

	Feb. 1, 1947	Jan., 1947	Nov., 1946	Feb., 1946
Bessemer, del. Pittsburgh	$31.83	$31.815	$29.77	$26.94
Basic, Valley	30.00	30.00	28.00	25.25
Basic, eastern del. Philadelphia	32.01	31.99	29.93	27.09
No. 2 fdry., del. Pgh. N. & S. sides	31.33	31.315	29.27	28.44
No. 2 fdry., del. Philadelphia	32.51	32.49	30.43	27.59
No. 2 foundry, Chicago	30.50	30.50	28.50	25.75
Southern No. 2, Birmingham	26.88	26.88	24.88	22.13
Southern No. 2, del. Cincinnati	31.75	31.75	28.94	26.05
Malleable, Valley	30.50	30.50	28.50	25.75
Malleable, Chicago	30.50	30.50	28.50	25.75
Charcoal, low phos., fob Lyles, Tenn.	37.50	37.50	33.00	33.00
Gray forge, del. McKees Rocks, Pa.	30.66	30.65	28.61	25.80
Ferromanganese, fob cars, Pittsburgh	140.00	140.00	140.00	140.00

Scrap

Heavy melting steel, No. 1, Pittsburgh	$32.50	$32.50	$23.00	$20.00
Heavy. melt. steel, No. 2, E. Pa.	31.50	31.00	21.90	18.75
Heavy melting steel, Chicago	30.00	30.00	21.75	18.75
Rails for rolling, Chicago	38.50	35.688	24.25	22.25
No. 1 cast, Chicago	42.50	41.25	29.00	20.00

Coke

Connellsville, furnace ovens	$8.875	$8.812	$8.75	$7.50
Connellsville, foundry ovens	9.875	9.812	9.50	8.25
Chicago, by-product fdry., del.	16.10	15.912	15.10	13.75

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Finished steel quoted in cents per pound and semifinished in dollars per gross ton, except as otherwise noted. Delivered prices do not include the 3 per cent federal tax on freight.

Semifinished Steel

Carbon Steel Ingots: Rerolling quality, standard analysis, price negotiated, fob mill. Copperweld Steel Co., electric furnace melted carbon ingots, $55-$60, Warren, O. Forging quality, $40, Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown.

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, Coatesville, uncrop, $52.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $42; Portsmouth Steel Corp., $55-$60, Portsmouth, O. Detroit, del., $45.36; eastern Mich., $46.48.

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $50; Detroit, del., $53.36; eastern Mich., $54.48.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $61; del. Detroit $64.36; eastern Mich., $65.48.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $50; Portsmouth Steel Corp., $66 Portsmouth, O.

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb 2.35c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, ¼ to 5/16-in., inclusive, $2.55-$2.80 per 100 lb. Galveston base, $2.65. Worcester, add $0.10.

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3-in.: Pittsburgh, Youngstown, Chicago, Gary, Cleveland, Buffalo, Birmingham base, 20 tons one size, 2.60c; Duluth, base, 2.60c; Detroit, del., 2.75c; eastern Mich., 2.80c; New York, del., 3.01c; Phila., del., 2.98c.

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 3.05c; Detroit, del., 3.20c; eastern Mich., 3.25c. (Texas Steel Co. uses Chicago base price as maximum fob Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 20,000-39,999 lb, 3.20c; Detroit, 3.35c; Toledo, 3.40c.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 3.80c; Detroit, del., 3.95c; eastern Mich., 4.00c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base, 2.45c; Detroit, del., 2.60c; eastern Mich. and Toledo, 2.65c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo, base, 2.45c; Detroit, del., 2.60c; eastern Mich. and Toledo, del., 2.65c.

Iron Bars: Single refined, Pitts., 6.15c; double refined, 7.00c; Pittsburgh, staybolt, 7.85c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base, 2.50c; Detroit, del., 2.65c; eastern Mich., del., 2.70c; Philadelphia, del., 2.70c; New York, del., 2.79c. (Andrews Steel Co., quotes on Middletown, O., base for shipment to Detroit area; Alan Wood Steel Co., Conshohocken, Pa., quotes 3.10c, Sparrows Point Md., base; Granite City Steel Co., 2.875c, fob Granite City, Ill., 2.775c, fob Gary or Birmingham.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.20c; Granite City, base, 3.30c; Detroit, del., 3.35c; eastern Mich., del., 3.40c; New York, del., 3.61c; Philadelphia, del., 3.58c.

Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, Youngstown, Sparrows Point, Middletown, base 3.55c; New York, del., 3.84c; Philadelphia, del., 3.75c.

Corrugated Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, base, 3.55c.

Culvert Sheets, No. 16, not corrugated, copper alloy: Pittsburgh, Chicago, Gary, Birmingham, 4.15c; Granite City, 4.25c; copper iron 4.50c; pure iron, 4.50c.

Aluminized Sheets, No. 20 hot-dipped, coils or cut to lengths: Pittsburgh, 9.00c.

Long Ternes, No. 10: Pittsburgh, Chicago, Gary, base, 3.55c.

Enameling Sheets, No. 12: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 3.55c; Granite City, base, 3.65c; Detroit, del., 3.70c; eastern Mich., 3.75c.

Electrical Sheets, No. 24: Pittsburgh, Chicago, Gary base prices: Field grade, 4.20c; armature, 4.50c; electrical, 5.00c; motor, 5.75c dynamo, 6.45c; Granite City base prices 10 points higher.
Pittsburgh, Chicago, Gary base prices: Transformer 72, 6.95c; 65, 7.65c; 58, 8.35c; 52, 9.15c.

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 2.50c; Detroit, del., 2.65c; eastern Mich., del., 2.70c. (Superior Steel Corp., 3.30c, Pittsburgh).

Cold-Rolled Strip, 0.25 carbon and less: Pittsburgh, Cleveland, Youngstown, 3.20c; Chicago, base, 3.30c; Detroit, del., 3.35c; eastern Mich., 3.40c; Wooster, base, 3.40c. (Superior Steel Corp., 4.70c, Pittsburgh.)

Cold-Finished Spring Steel, 0.26-0.50 carbon: Pittsburgh, Cleveland, base, 3.03c; add 0.20c for Worcester.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, Warren, O., 100-lb base box, $5.75; Granite City, Birmingham, Sparrows Point, $5.85.

Electrolytic Tin Plate: Pittsburgh, Gary, Warren, O., 100-lb base box 0.25 lb tin, $4.85; 0.50 lb tin, $5.05; 0.75 lb tin, $5.25; Granite City, Birmingham, Sparrows Point, $4.95, $5.15, $5.35, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, Warren, O., base 29-gage and lighter, 3.60c; Granite City, Birmingham, Sparrows Point, 3.70c.

Manufacturing Ternes (Special Coated): Pittsburgh, Chicago, Gary, 100-base box, $4.90; Granite City, Birmingham, Sparrows Point, $5.00.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I. C. 8-lb $13.50; 15-lb $15.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, 2.65c; Coatesville, Claymont, Geneva, Utah, 2.80c; New York, del. 2.94c; Phila., del., 2.85c; St. Louis, del., 2.74c; Boston, del., 2.86c.
(Central Iron & Steel Co., Harrisburg, Pa., 3.40c, basing points; Alan Wood Steel Co., Conshohocken, Pa., 2.80c, Coatesville and Claymont equivalent.)

Floor Plates: Pittsburgh, Chicago, 3.90c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, 3.787c; Coatesville, 4.15c.

Clad Steel Plates: Coatesville, 10% cladding: nickel clad, 21.50c; inconel-clad, 30.00c; monel-clad, 29.00c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.50c; Geneva, Utah, 2.65c; New York, del., 2.70c; Phila., del., 2.64c.
(Phoenix Iron Co., Phoenixville, Pa., nominally, 3.05c, Bethlehem, Pa., equivalent.)

Steel Piling: Pittsburgh, Chicago, Buffalo, $3 per 100 lb.

Wire and Wire Products

(Fob Pittsburgh, Chicago, Cleveland and Birmingham per 100 pounds).

Wire to Manufacturers in carloads
Bright, basic or bessemer.....*$3.30-$3.55
Spring (except Birmingham)..... **$4.25

Wire Products to Trade
Nails and Staples
Standard and cement-coated.....†$3.75-$4.50
Galvanized .....‡$3.75-$4.50

Wire, Merchant Quality
Annealed (6 to 8 base)..... §$3.95
Galvanized (6 to 8 base)..... §$4.40
(Fob Pittsburgh, Chicago, Cleveland, Birmingham, per base column)
Woven fence, 15 gage and heavier..... 84
Barbed wire, 80-rod spool..... 94
Barbless wire, twisted 94
Fence posts ..... ††82
Bale ties, single loop..... 86

* Add $0.10 for Worcester, $0.05 for Duluth and $0.535 for Pacific ports.
** Add $0.10 for Worcester, $0.25 for Duluth and Trenton, N. J., $0.535 for Pacific ports.
† Add $0.30, Worcester, $0.535, Pacific ports.
‡ Add $0.535 for Pacific ports.
§ Add $0.10, Worcester; $0.735, Pacific ports.
†† Add 2 for Duluth.

Rails, Supplies

Rails: Standard, over 60-lb, fob mill, $2.50 per 100 lb. Light rails (billet), Pittsburgh, Birmingham, $2.85 per 100 lb.

Relaying, 35 lb and over, fob railroad and basing points, $31-$33 per net ton.

Supplies: Track bolts, 6.50c; heat treated, 6.75c. Tie plates, $2.80 per 100 lb, fob mill. Splice bars, $3 per 100 lb. Standard spikes, 3.65c-4.50c; screw spikes, 5.30c-6.40c.

Tubular Goods

Standard Pipe: Base price in carloads, threaded and coupled, to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind., 2 points less on lap weld and 1 point less on butt weld on sizes produced in that district. Pittsburgh base only on wrought iron pipe.

Butt Weld

	Steel			Iron	
In.	Blk.	Gal.	In.	Blk.	Gal.
⅛	48	23	¼	— 2	+20
¼ & ⅜	51	30½	⅜	—11½	+10
½	55½	41	½	—17	+ 2
¾	58½	45	¾-1¼	—22½	— 1½
1-3	60½	47½	1½-2	—23	— 2

Lap Weld

	Steel			Iron	
In.	Blk.	Gal.	In.	Blk.	Gal.
2	53	39½	1¼	— 1	+20
2½-3	56	42½	1½	— 7	+13
3½-6	58	44½	2	—14½	+ 5½
*8	58	42½	2½-3½	—17	+ 1½
*10	57½	42	4	—21	— 4
*12	56½	41	4½-8	—19	— 2½
			9-12	—10	+ 7

* Not T. & C.

Seamless
Steel

In.	Blk.	Gal.	In.	Blk.	Gal.
2	52	38½	*8	57	42
2½-3	55	41½	*10	56½	42
3½-6	57	43½	*12	55½	41

* Not T. & C.

Line Pipe

In.	Seamless	In.	Butt Weld
2	51	⅛	47
2½ & 3	54	¼ & ⅜	50
3½ to 8	56	½	54½
10	55½	¾	57½
12	54½	1 to 3	59½

Boiler Tubes: Net base prices per 100 feet, fob Pittsburgh, in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

		Seamless		Elec. Weld	
O.D. Sizes	B.W.G.	Hot Rolled	Cold Drawn	Hot Rolled	Cold Drawn
1"	13	....	$10.89	$10.62	$10.62
1¼"	13	....	12.90	10.59	12.58
1½"	13	$12.00	14.26	11.70	13.90
1¾"	13	13.65	16.23	13.31	15.82
2"	13	15.29	18.17	15.00	17.95
2¼"	13	17.05	20.26	16.71	20.00
2¼"	12	18.78	22.31	18.38	22.00
2½"	12	20.57	24.43	20.11	24.07
2¾"	12	21.80	25.89	21.27	25.46
3"	12	22.87	27.18	22.26	26.68
3¼"	11	26.88	31.94	26.15	31.33
3½"	11	28.86	34.30	28.06	33.64
4"	10	35.82	42.55	34.78	41.68
4½"	9	47.48	56.42	....	....
5"	9	54.96	65.30	....	....
6"	7	84.38	100.25	....	....

Pipe, Cast Iron: Class B, 6-in. and over, $65 per net ton, Birmingham; $70, Burlington, N. J.; $75.56, del., Chicago; 4-in. pipe, $5 higher, Class A pipe, $3 a ton over class B.

Bolts, Nuts

Fob Pittsburgh, Cleveland, Birmingham, Chicago; add 15c per cwt, Lebanon, Pa. Additional discounts: 5 for carloads; 15 for full containers, except tire, step and plow bolts.

Carriage and Machine

½-in. and smaller; up to 6 in. in length	55 off
⅝ and ¾, up to 6 in. in length	52 off
¾ x 6 in.	49 off
⅞ and 1 in. x 6 in. length	51 off
1⅛ in. and larger in all lengths and ⅞ in. and larger in lengths over 6 in.	48 off
½ in. and smaller, longer than 6 in.	45 off
Tire bolts	38½ off
Step bolts	46 off
Plow bolts	57 off

Stove Bolts
In packages, nuts separate, 60-10 off; bulk 74 off on 15,000 of 3-in. and shorter, or 5000 over 3-in., nuts separate.

Nuts

	A.S. Light	A. S. Reg. and Heavy
Semifinished hexagon		
⅞-in. and smaller	51 off	....
½-in. and smaller	....	48 off
½-in.-1-in.	48 off	....
⅝-in.-1-in.	....	47 off
1⅛-in.-1½-in.	46 off	45 off
1⅝-in. and larger	....	44 off

Additional discount of 15 for full containers.

Hexagon Cap Screws

Upset 1-in., smaller (10-20 bright)	56 off
Upset (10-35 heat treated)	51 off
⅝ x 6	47 off
¾, ⅞ & 1 x 6	

Square Head Set Screws

Upset 1-in. and smaller	61 off
Headless, ¼-in. and larger	46 off
No. 10 and smaller	56 off

Rivets

Fob Pittsburgh, Cleveland, Chicago Birmingham, Lebanon, Pa.

Structural	5.25c
⅞-inch and under	55-5 off

Washers, Wrought

Fob Pittsburgh, Chicago, Philadelphia, to jobbers and large nut and bolt manufacturers, lcl .....$1.50-$2.00 off

Tool Steels

Tool Steel: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb; reg. carbon 15.15c; extra carbon 19.48c; special carbon 23.80c; oil-hardening 25.97c; high carbon-chromium 46.53c.

W	Cr	V	Mo	Base, per lb
18.00	4	1	...	72.49c
1.5	4	1	8.5	58.43c
....	4	2	3	58.43c
6.40	4.15	1.90	5	62.22c
5.50	4.50	4	4.50	75.74c

Stainless Steels

Base, Cents per lb

Grade	Bars, Drawn Wire, Structurals	Plates	Sheets	Hot Rolled Strip	Cold Rolled Strip
CHROMIUM NICKEL STEELS					
301	26.00c	29.50c	37.00c	22.00c	28.00c
302	26.00	29.50	37.00	23.50	30.50
303	28.50	31.50	39.00	29.50	36.00
304	27.50	31.50	39.00	25.50	32.50
308	31.50	37.00	44.50	31.00	38.00
309	39.00	43.50	51.00	40.50	51.00
310	53.50	56.50	57.50	53.00	61.00
316	43.50	48.00	52.00	43.50	52.00
321	31.50	37.00	44.50	32.00	41.50
347	36.00	41.50	49.00	36.00	45.50
431	21.00	24.00	31.50	19.00	24.50
440A	26.00	31.00	36.50	26.00	30.50
STRAIGHT CHROMIUM STEEL					
403	23.50	27.00	32.00	23.00	29.50
410	20.50	23.50	29.00	18.50	24.00
416	21.00	24.00	29.50	20.00	25.50
420	26.00	31.00	36.50	26.00	33.50
430	21.00	24.00	31.50	19.00	24.50
430F	21.50	24.50	32.00	20.50	27.00
442	24.50	28.00	35.50	26.00	35.00
443	24.50	28.00	35.50	26.00	35.00
446	30.00	33.00	39.50	38.00	56.50
*501	9.00	13.00	17.50	13.00	18.50
*502	10.00	14.50	18.50	14.50	19.50
†STAINLESS CLAD STEEL (20%)					
304	....	24.00	22.00	....	....
410	....	22.00	20.00	....	....
430	....	22.50	20.50	....	....
446	....	29.00	27.00	....	....

* Low chromium. † Fob Pittsburgh and Washington, Pa.; plate prices include annealing and pickling.

Metallurgical Coke

Price Per Net Ton

Beehive Ovens	
Connellsville, furnace	*$3.75-$9.00
Connellsville, foundry	9.75-10.00
New River, foundry	11.75
Wise county, foundry	9.00- 9.50
Wise county, furnace	8.50- 9.00

* Operators of hand-drawn ovens using trucked coal, $9.35-$9.60.

Coke By-Products

Spot, gal. freight allowed east of Omaha	
Pure and 90% benzol	17.00c
Toluol, two degree	22.00c
Industrial xylol	22.00c
Solvent naphtha	26.00c
Per pound fob works	
Phenol (car lots, returnable drums)	11.25c
Do., less than carlots	12.00c
Do., tank cars	10.25c
Eastern plants, per pound	
Naphthalene flakes, balls, bbl, to jobbers, "household use"	9.50c
Per ton, bulk, fob plants	
Sulphate of ammonia	$30.00

PIG IRON

Prices per gross ton. Minimum delivered prices do not include 3 per cent federal tax.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$31.50	$31.00	$32.50	$32.00
Newark, N. J., del.	33.34	32.84	34.34	35.54
Brooklyn, N. Y., del.	34.50	....	....	35.00
Birdsboro, Pa., base	34.00	34.00	35.50	35.00
Birmingham, base	26.88	25.50	31.50	....
Baltimore, del.	33.28	....	....	....
Boston, del.	*31.62	....	....	....
Chicago, del.	*30.72	....	....	....
Cincinnati, del.	31.75	30.37	....	....
Newark, N. J., del.	32.96	....	....	....
Philadelphia, del.	32.13	31.63	....	....
St. Louis, del.	*30.62	*31.54	....	....
Buffalo, base	30.50	30.00	31.50	31.00
Boston, del.	36.98	36.48	37.98	37.48
Rochester, del.	32.34	31.84	33.34	32.84
Syracuse, del.	33.00	32.50	34.00	33.50
Chicago, base	30.50	30.00	31.00	30.50
Milwaukee, del.	31.82	31.32	32.32	31.82
Muskegon, Mich., del.	34.33	....	....	34.33
Cleveland, fob furnace	30.50	30.00	31.00	30.50
Akron, Canton, del.	32.17	31.67	32.67	32.17
Detroit, base	30.50	30.00	31.00	30.50
Saginaw, Mich., del.	33.67	33.17	34.17	33.67
Duluth, base	31.00	30.50	31.50	31.00
Erie, Pa., base	30.50	30.00	31.50	31.00
Everett, Mass., base	29.50	29.00	30.50	30.00
Boston, del.	30.00	29.50	31.00	30.50
Granite City, Ill., base	30.50	30.00	31.00	30.50
St. Louis, del.	31.25	30.75	....	31.25
Neville Island, Pa., base	30.50	30.00	31.00	30.50
†Pittsburgh, del., N.&S. sides	31.33	30.83	31.83	31.33
Provo, Utah, base	30.50	30.00	....	....
Sharpsville, Pa., base	30.50	30.00	31.00	30.50
Steelton, Pa., base	31.50	31.00	32.50	32.00
Swedeland, Pa., base	31.50	31.00	32.50	32.00
Philadelphia, del.	32.51	32.01	....	33.01
Toledo, O., base	30.50	30.00	34.50	34.00
Cincinnati, del.	34.00	33.50	....	....
Youngstown, O., base	30.50	30.00	31.00	30.50
Mansfield, O., del.	33.48	32.98	33.98	33.48

* Plus Jan 1 freight rate increase.

† To Neville Island base add: 66c for McKees Rocks, Pa.; $1.01 Lawrenceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa; 97c (water), Monongahela; $1.33, Oakmont, Verona; $1.49 Brackenridge.

Exceptions to above prices: Kaiser-Frazer Parts Corp., Struthers, O., charges 50 cents a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable pig iron.

High Silicon Silvery

6.00-6.50 per cent (base).....$38.00
6.51-7.00..$39.00 9.01- 9.50. 44.00
7.01-7.50.. 40.00 9.51-10.00. 45.00
7.51-8.00.. 41.00 10.01-10.50. 46.00
8.01-8.50.. 42.00 10.51-11.00. 47.00
8.51-9.00.. 43.00 11.01-11.50. 48.00

Fob Jackson, O., per gross ton. Buffalo base $1.25 higher. Buyer may use whichever base is more favorable.

Electric Furnace Ferrosilicon: Si 14.01-14.50%, $52.75, Jackson, O.; $56 Keokuk, Iowa; $54, Buffalo and Niagara Falls, N. Y. Add $1 a ton for each additional 0.5% Si to 18%; 50c for each 0.5% Mn over 1%; $1 a ton for 0.045% max. phos.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Semi-cold blast, low phosphorus. Fob furnace, Lyles, Tenn. $37.50 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $30.00

Low Phosphorus

Steelton, Pa., Buffalo, Troy, N. Y., $36, base; Birdsboro, Pa., $39, base; Philadelphia, $38.16, del. Intermediate phosphorus, Central furnace, Cleveland, $33.

Differentials

Basing point prices are subject to following differentials:

Silicon: An additional charge not to exceed 50 cents a ton for each 0.25 per cent silicon in excess of base grade (1.75% to 2.25%).

Phosphorus: A reduction of 38 cents a ton for phosphorus content of 0.70 per cent and over.

Manganese: An additional charge not to exceed 50 cents a ton for each 0.50 per cent, or portion thereof, manganese in excess of 1%.

Nickel: An additional charge for nickel content as follows: Under 0.50%, no extra; 0.50% to 0.74%, inclusive, $2 a ton; for each additional 0.25% nickel, $1 a ton.

Refractories

Per 1000, fob shipping point
Net Prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky. $81.00

High Heat Duty

Pa., Ill., Md., Mo., Ky. 65.00
Ala., Ga. 65.00
N. J. 70.00

Intermediate Heat Duty

Ohio 57.00
Pa., Ill., Md., Mo., Ky. 59.00
Ala., Ga. 51.00
N. J. 62.00

Low Heat Duty

Pa., Md., Ohio 51.00

Malleable Bung Brick

All bases 75.00

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry Press 42.00
Wire Cut 40.00

Silica Brick

Pennsylvania 65.00
Joliet, E. Chicago 74.00
Birmingham, Ala. 65.00

Magnesite

Domestic dead-burned grains, net ton, fob Chewelah, Wash.
Bulk 22.00
Bags 26.00

Basic Brick

Net ton, fob Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick 54.00
Chem. bonded chrome 54.00
Magnesite brick 76.00
Chem. bonded magnesite..... 65.00

ORES

Lake Superior Iron Ore

Gross ton, 51½% (Natural) Lower Lake Ports

Old range bessemer..... $5.95
Old range nonbessemer..... 5.80
Mesabi bessemer 5.70
Mesabi nonbessemer..... 5.55
High phosphorus 5.55

Eastern Local Ore

Cents, units, del. E. Pa.
Foundry and basic 56-63% contract 13.00

Foreign Ore

Cents per unit, cif Atlantic ports

Manganiferrous ore, 45-55% Fe., 6-10% Mn.. Nom.
N. African low phos.. Nom.
Swedish basic, 60 to 68% 13.00
Spanish, No. African basic, 50 to 60%..... Nom.
Brazil iron ore, 68-69% fob Rio de Janeiro... 7.50–8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid $24.00

Chrome Ore

Gross ton fob cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Oreg., or Tacoma, Wash. (S S paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1 ..... $37.50
48% 3:1 ..... 39.00
48% no ratio 31.00

South African (Transvaal)

44% no ratio.....$27-$27.50
45% no ratio..... 28.00
48% no ratio..... 30.00
50% no ratio..... 31.00

Brazilian—nominal

44% 2.5:1 lump..... $33.65
48% 3:1 lump 43.50

Rhodesian

45% no ratio.....$27-$27.50
48% no ratio..... 30.00
48% 3:1 lump..... 39.00

Domestic (seller's nearest rail)
48% 3:1 ..... $39.00

Manganese Ore

Sales prices of Office of Metals Reserve, cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91c; prices include duty on imported ore and are subject to established premiums, penalties and other provisions. Price at basing points which are also points of discharge of imported manganese ore is fob cars, shipside, at dock most favorable to the buyer. Outside shipments direct to consumers at 15c per unit less than Metals Reserve prices.

Molybdenum

Sulphide conc., lb., Mo. cont., mines $0.75

Fluorspar

Metallurgical grade, fob shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content, 70% or more, $33; 65% to 70%, $32; 60% to 65%, $31; less than 60%, $30.

HIGH-STRENGTH—LOW-ALLOY STEELS

Prices in dollars per 100 pounds.

	Pittsburgh	Chicago	Gary	Youngstown	Sparrows Point	Buffalo	Bethlehem	Canton	Massillon
Sheets, Hot-Rolled	3.75–3.85	3.75–3.85	3.75–3.85	3.85	3.85	3.75–3.85	...	...	...
Cold-Rolled	4.55–4.75	4.55–4.75	4.55–4.75	4.75	...	4.55–4.75	...	...	...
Galvanized	5.40	.....	.....	...	...	.....	...	...	...
Strip, Hot-Rolled	3.75–3.85	3.75–3.85	3.75–3.85	3.85	...	.....	...	...	...
Cold-Rolled	4.55	4.65	4.65	4.65	...	.....	...	...	...
Shapes, Structural	3.85	3.85	.....	3.85	...	.....	3.85	...	...
Plates	4.10	4.10	4.10	...	4.10	.....	...	...	...
Bars and Bar Shapes	4.00	4.00	4.00	4.00	...	4.00	4.00	4.00	4.00

Note: Lower level of quoted ranges represent prices for NAX, produced by Great Lakes Steel Corp., Detroit.

WAREHOUSE STEEL PRICES

Base prices, cents per pound, for delivery within switching limits, subject to extras

	SHEETS					STRIP		BARS				PLATES	
	H-R 10G	C-R 10G	C-R 17G	Gal. •10G	Gal. •24G	†H-R	C-R	H-R	C-F	H-R Alloy (‡4140)	Structural Shapes	Carbon ¾"-¾"	Floor ¾" & Thicker
Boston (city)	4.50	....	5.22[4]	6.80[4]	6.80[4]	4.65	6.36	4.62	5.47	7.12	4.47	4.80	6.42
Boston (country)	3.90	....	4.60[4]	....	6.20[4]	3.95	....	4.00	4.85	6.50[11]	3.95	4.20	5.65
Norfolk, Va.	4.35	....	....	....	....	....	....	4.75	5.50	....	4.50	4.50	6.25
††New York (city)	4.42	....	5.27[8]	5.47[8]	....	4.62	....	4.62	5.42	8.42[9]	4.37	4.64	6.35
††New York (country)	4.32	....	5.17[8]	5.37[8]	....	4.52	....	4.52	4.85	....	4.27	4.54	6.25
Baltimore (city)	4.09	....	5.65[3]	....	6.39[8]	4.40	....	4.45	5.35	....	4.34	4.39	5.90
Baltimore (country)	3.59	....	5.55[3]	....	....	....	....	....	4.85	....	4.24	4.29	5.80
Buffalo (city)	4.00	....	4.70[6]	4.35[5]	....	4.30	4.95	4.05	4.95	....	4.05	4.60	5.90
Buffalo (country)	3.90	....	4.60[6]	4.95[5]	....	3.90	4.60	3.95	4.85	6.60	3.95	4.20	5.45
Philadelphia (city)	4.24	5.73	5.33[9]	....	6.54[5]	4.43	5.28	4.48	5.38	6.87	4.22	4.40	5.93
Philadelphia (country)	4.14	5.63	5.23[9]	....	6.44[5]	4.33	5.18	4.38	4.85	6.60	4.12	4.30	5.83
Pittsburgh (city)	4.00	5.15	4.70[3]	5.05	6.30[3]	4.00	4.95	4.05	4.95	6.60	4.05	4.30	5.55
Pittsburgh (country)	3.90	5.05	4.60[3]	4.95	6.20[3]	3.90	4.85	3.95	4.85	6.60	3.95	4.20	5.45
Cleveland (city)	4.00	5.15	4.70[3]	5.238[3]	6.488[3]	4.188	....	4.05	4.95	6.858	4.311	4.30	5.811
Cleveland (country)	3.90	5.05	4.60[3]	....	....	....	....	3.95	4.85	....	....	4.20	....
Cincinnati	4.116	5.266[3]	....	5.166[5]	....	4.394	....	4.403	5.303	....	4.444	4.653	5.944
Chicago (city)	4.00	....	4.70[3]	....	6.30[3]	4.00	....	4.05	4.95	6.60	4.05	4.30	5.70
Chicago (country)	3.90	....	4.60[3]	....	6.20[3]	3.90	....	3.95	4.85	6.60	3.95	4.20	5.60
Milwaukee	5.99	...	6.69[5]	...	8.29[5]	5.99	....	6.04	6.94	8.59	6.04	6.29	7.69
Indianapolis	4.04	...	4.84[11]	5.29	6.54	4.24	....	4.36††	5.26[12]	11.01	4.36	4.61	6.01
St. Paul	4.384[1]	5.534[3]	5.084[3]	5.434[5]	6.684[5]	4.404[13]	....	4.434[13]	5.726[11]	7.084[11]	4.434[13]	4.684[13]	6.084[13]
St. Louis	4.199	....	4.899[9]	....	6.674[5]	4.199	....	4.249	5.324	7.074	3.999	3.999	5.999
New Orleans	4.46••	....	5.77[3]	....	....	4.83	....	4.78••	6.14	....	....	....	....
Houston, Tex.	4.50[1]	....	....	6.00[10]	....	....	....	4.75[1]	....	....	....	....	....
Oklahoma, Nebr.	4.868	6.118[3]	....	5.918[5]	7.168[5]	4.862	....	4.918	5.818[11]	....	4.918	5.168	6.568
Omaha, Nebr.	4.868	6.118[3]	....	5.918[5]	7.168[5]	4.862	....	4.918	5.818[11]	....	4.918	5.168	6.568
San Francisco	4.90	....	6.30[5]	....	7.35[5]	5.20[14]	8.35[15]	4.75[14]	•••	9.35[16]	4.90[14]	5.00[14]	6.80[14]
Tacoma, Wash.	...	...	...	7.30[5]	...	5.20[17]	....	4.90[17]	6.75[2]	8.95[2]	4.95[17]	5.25[17]	7.25[17]
Seattle	...	...	...	7.30[5]	...	5.20[17]	....	4.90[17]	6.75[2]	8.95[3]	4.95[17]	5.25[17]	7.25[17]

Base Quantities: 400 to 1999 pounds except as noted: Cold-rolled strip, 2000 to 39,999 pounds; cold finished bars, 1000 pounds and over; [1]—any quantity; [2]—300 to 1999 pounds; [3]—150 to 2249 pounds; [4]—three to 24 bundles; [5]—450 to 1499 pounds; [6]—one bundle to 1499 pounds; [7]—one to nine bundles; [8]—400 to 1499 pounds; [9]—1000 to 1999 pounds; [10]—450 to 39,999 pounds; [11]—1000 to 39,999 pounds; [12]—1000 pounds and over; [13]—400 to14,999 pounds; [14]—400 to 39,999; [15]—2000 lb and over; [16]—1000 to 49,999; [17]—300 to 9999 pounds.

• Includes gage and coating extra; † does not include gage extras; ‡ basing point cities with quotations representing mill prices plus warehouse spread; § as rolled, except New York, Jersey City and Indianapolis where price represents annealed bars; •• add 0.46 for sizes not rolled in Birmingham; †† same prices quoted for Jersey City, N. J.; ‡‡ add 15c for 100 lb for slow moving items; §§ 18 gage and heavier; •••rounds under ⅜ in. 7.00c, ⅜ in. and over 6.50c, squares, hexagons and flats 6 in. and narrower 7.50c, flats over 6 in. 8.25c.

Open Market Prices of Leading Ferroalloy Products

Spiegeleisen: 19-21% carlot per gross ton, Palmerton, Pa., $40; Pittsburgh, $40.50; Chicago, $40.60.

Ferromanganese, standard: 78-82% c.l. gross ton, duty paid, $135 fob cars, Baltimore, Philadelphia or New York, whichever is most favorable to buyer, Birmingham, Ala. (where Sloss-Sheffield Steel & Iron Co. is producer); $140 fob cars, Pittsburgh, including 50c switching charge, (where Carnegie - Illinois Steel Corp. is producer); add $8 for packed c.l., $10 for ton, $13.50 for less ton; $1.70 for each 1%, or fraction contained manganese over 82% or under 78%.

Ferromanganese, low carbon: Eastern zone: Special, 21c; regular, 20.50c; medium, 14.50c; central zone: special, 21.30c; regular, 20.80c; medium, 14.80c; western zone: Special, 21.70c; regular, 21.20c; medium, 15.20c. Prices are per pound contained Mn, bulk carlot shipments, fob shipping point, freight allowed. Special low-carbon has content of 90% Mn, 0.10% C, and 0.06% P.

Ferromanganese Briquets: (Weight approx. 3 lb and containing exactly 2 lb Mn) Prices per lb of briquets: Contract, carlots, bulk 6.40c, packed 6.90c, tons 7.30c, less 7.70c, eastern, freight allowed; 6.65c, 7.15c, 7.90c and 8.30c, central; 7.20c, 7.70c, 9.80c and 10.20c, western; spot up 0.25c; notched up 0.25c.

Ferrotungsten: Spot, 10,000 lb or more, per lb contained W, $1.90; contract, $1.88; freight allowed as far west as St. Louis.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb contained Ti; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5c per lb.

Ferrotitanium: 20-25%, 0.10 maximum C; per lb contained Ti; ton lots $1.35; less-ton lots $1.40 eastern. Spot up 5c per lb.

Ferrotitanium, High-Carbon: 15-20% contract basis, per net ton, fob Niagara Falls, N. Y., freight allowed to destination east of Mississippi river and north of Baltimore and St. Louis, 6.8% C $142.50; 3-5% C $157.50.

Ferrovanadium: V .35-55%, contract basis, per lb contained V, fob producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Ferromolybdenum: 55-75% per lb, contained Mo, fob Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% P content with unitage of $3 for each 1% of P above or below the base; gross tons per carload fob sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Contract, lump, packed; eastern zone quotations: 90-95% c.l. 12.95c, ton lots 13.45c, smaller lots 13.95c; 80-90%, c.l. 11.35c, ton lots 11.90c, smaller lots 12.45c; 75%, c.l. 10.15c, ton lots 10.75c, smaller lots 11.35c; 50% c.l. 8.45c, ton lots 9.10c, smaller lots 9.75c. Deduct 1.0c for bulk carlots 75%, 80-90%, 90-95%. Prices are fob shipping point, freight allowed, per lb of contained Si. Spot prices 0.25c higher on 80-90%, 0.30c on 75%, 0.45c on 50%.

Ferroboron: (B 17.50% max. and C 1.50% max., Al 0.50% max. and C 0.50% max.) Prices per lb of alloy, contract, ton lots $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Ferrocolumbium: 50-60%, per lb contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.50; less ton lots $2.55. Spot up 10c.

Ferrochrome: Contract, lump, packed; **high carbon,** eastern zone, c.l. 16.20c, ton lots 16.80c; central zone, add 0.40c and 1.30c; western zone, add 0.55c and 2.10c. Deduct 0.60c for bulk carlots.

High carbon, high nitrogen, add 5c to all high carbon ferrochrome prices. Deduct 0.55c for bulk carlots. Spot prices up 0.25c.

Low carbon, eastern zone, bulk, c.l., max. 0.06% C 23c; 0.1% 22.50c, 0.15% 22c, 0.2% 21.50c, 0.5% 21c, 1% 20.50c, 2% 19.50c; add 1c for 2000 lb to c.l.; central zone, add 0.4c for bulk, c.l., and 0.65c for 2000 lb to c.l.; western zone, add 0.5c for bulk, c.l., and 1.85c for 2000 lb to c.l.; carload packed differential 0.45c. Prices are per pound of contained Cr, fob shipping points.

Low carbon, high nitrogen: Add 2c to low carbon ferrochrome prices. For higher nitrogen low carbon, add 2c for each 0.25% of nitrogen over 0.75%.

Ferrochrome, Special Foundry: (Cr 62-66%, C above 5-7%.) Contract, 2-inch x D, packed, eastern zone, freight allowed, c.l. 17.05c, ton lots 17.60c, less than ton 18.30c; central zone, add 0.40c for c.l. and 1.30c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Deduct 0.60c for bulk carlots.

S. M. Ferrochrome, high carbon: (Cr 60-65%, Si, Mn and C 4-6% each.) Contract, lump, packed, eastern zone, freight allowed, c.l. 17.30c, ton lots 17.90c, less than ton 18.60c; central zone, add 0.40c for c.l. and 1.30c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Prices are per pound of contained chromium, spot prices 0.25c higher. Deduct 0.60c for bulk carlots.

S. M. Ferrochrome, low carbon: (Cr 62-66%, Si 4-6%, Mn 4-6% and C 1.25% max.) Contract, carlot, bulk 20.00c, packed 20.15c; ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained Cr; 20.40c, 20.50c, 20.95c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up 0.25c.

Ferrochrome Briquets: Containing exactly 2 lb Cr, packed eastern zone, c.l. 10.35c, ton lots 10.75c, less than ton 11.15c; central zone, add 0.25c for c.l. and 0.90c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Deduct 0.50c for bulk carlots. Prices per pound of briquets; spot prices 0.25c higher; notched, 0.25c higher.

Chromium Metal: 97% min. Cr, max. 0.50% C, eastern zone, per lb contained Cr bulk, c.l. 79.50c, 2000 lb to c.l. 80c; central 81c and 82.60c; western 82.25c and 84.75c, fob shipping point, freight allowed.

Chromium-Copper: (Cr 8-11%, Cu 88-90%, Fe 1% max., Si 0.50% max.) Contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Calcium metal; cast: Contract, ton lot or more, $1.60; 100 to 1999 lb, $1.95; less than 100 lb, $3.15 per lb of metal, eastern zone; $1.615, $1.965 and $3.185, western; spot up 5c.

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%), per lb of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up 0.25c.

Calcium - Silicon: (Ca 30-35%, Si

60-65% and Fe 3.00% max.), per lb of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up 0.25c.

Silicon Metal: Min. 97% Si and max. 1% Fe, eastern zone, bulk, c.l. 13.65c; 2000 lb to c.l., 15.05c; central zone, 14.25c and 17.30c; western; 14.85c and 19.05c; min. 96% Si and max. 2% Fe, eastern, bulk, c.l. 13.15c, 2000 lb to c.l. 14.65c; central, 13.85c and 16.90c; western, 14.45c and 18.65c, fob shipping point, freight allowed. Price per lb contained Si.

Silicomanganese, containing exactly 2 lb Mn and about ½ lb Si eastern zone, bulk, c.l. 6.15c, ton lots 7.05c; central zone, add 0.25c for c.l. and 0.60c for ton lots; western, add 0.80c for c.l. and 2.50c for ton lots. Notched, up 0.25c.

Ferrosilicon: Weighing about 5 lb and containing exactly 2 lb Si, packed, eastern zone, c.l. 4.20c, ton lots 4.60c, less than ton lots 5c; weighing about 2½ lb and containing 1 lb Si, packed, eastern zone, c.l. 4.35c, ton lots 4.75c, less 5.15c; notched 0.25c higher; central zone, add 0.25c for c.l. and 0.60c for smaller lots; western zone, add 0.45c for c.l. and 0.90c for smaller lots. Prices are fob shipping point, freight allowed; spot prices 0.25c higher. Deduct 0.50c for bulk carlots.

Manganese Metal: (Min. 96% Mn, max. 2% Fe), per lb of metal, eastern zone, bulk, c.l. 30c, 2000 lb to c.l., 32.00c; central 31.00c and 33.45c; western, 31.45c and 34.40c.

Electrolytic Manganese: 99.9% plus, fob Knoxville, Tenn., freight allowed east of Mississippi on 250 lb or more: Carlots 32c, ton lots 34c. drum lots 36c, less than drum lot 38c. Add 1½c for hydrogen-removed metal.

Manganese-Boron: (Mn 75% approx., B 15-20%, Fe 5% max., Si 1.50% max. and C 3% max.) Prices per lb of alloy. Contract, ton lots $1.89, less $2.01, eastern, freight allowed; $1.903 and $2.023, central; $1.935 and $2.055, western; spot up 5c.

Nickel-Boron: (B 15-18%, Al 1% max., Si 1.50% max., C 0.50% max., Fe 3% max., Ni, balance). Prices per lb of alloy, Contract, 5 tons or more $1.90, 1 ton to 8 tons $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Borosil: 3 to 4% B, 40 to 45% Si; $6.25 per lb contained B, fob Philo, O., freight not exceeding St. Louis rate allowed.

Bortam: B 1.5-1.9%, ton lots, 45c per lb; less-ton lots, 50c per lb.

Carbortam: B 0.90 to 1.15% net ton to carload, 8c per lb, fob Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

Silicaz Alloy: (Si 35-40%, Ca 9-11%, Al 5-7%, Zr 5-7%, Ti 9-11% and B 0.55-0.75%) Prices per lb of alloy, contract, or spot carlots 35.00c, ton lots 37.00c, less 39.00c, eastern, freight allowed; 35.30c, 38.10c and 40.10c, central; 35.30c, 40.05c and 42.05c, western; spot up 0.25c.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7% and Fe approx. 20%) Prices per lb of alloy, contract, carlots 12.50c, ton lots 13.25c, less 14.00c, eastern zone, freight allowed; 12.80c, 14.35c and 15.10c, central; 12.80c, 16.30c and 17.05c, western; spot up 0.25c.

CMSZ Alloy 4: (Cr 45-49%, Mn 4-6%, Si 18-21%, Zr 1.25-1.75% and C 3.00-4.50%). Contract or spot, carlots, bulk 12.00c, packed 12.75c; ton lots 13.50c, less 14.25c, eastern zone, freight allowed; 12.30c, 13.05c, 14.60c, 15.35c, central; 12.30c, 13.05c, 16.65c, 17.30c, western.

CMSZ Alloy 5: (Cr 50-56%, Mn 4-6%, Si 13.50-16.00%, Zr 0.75-1.25%, C 3.50-5.00%) Prices per lb of alloy, contract or spot, carlots, bulk 11.75c, packed 12.50c, ton lots 13.25c, less 14.00c, eastern, freight allowed; 12.05c, 12.80c, 16.30c, 17.05c, western.

Zirconium Alloy: 12-15%, per lb of alloy, eastern, contract, carlots, bulk 4.85c, packed 5.30c, ton lots 5.65c, less 6.00c; spot up 0.25c.

Zirconium Alloy: Zr 35-40%, eastern, contract basis, carloads in bulk or package, per lb of alloy 14.50c, ton lots 15.75c, less 17.00c; spot up 0.25c.

Alsifer: (Approx. 20% Al, 40% Si, 40% Fe) Contract basis fob Niagara Falls, N. Y., lump per lb 6.25c; ton lots 6.75c; less 7.25c. Spot up ½c.

Simanal: (Approx. 20% each Si, Mn, Al) Packed, lump, carload 9c, ton lots 9.25c, less-ton lots 9.75c per lb alloy; freight not exceeding St. Louis rate allowed.

Tungsten Metal Powder: Spot, not less than 97%, $2.50-$2.60; freight allowed as far west as St. Louis.

Grainal: Vanadium Grainal No. 1 87.5c; No. 6, 60c; No. 79, 45c; all fob Bridgeville, Pa., usual freight allowance.

Vanadium Pentoxide, technical grade: Fused, approx. 89-92% V_2O_5 and 5.84% NA_2O; or air dried, 83-85% V_2O_5 and 5.15% NA_2O, $1.10 per lb contained V_2O_5 fob plant freight allowed on quantities of 25 lb and over to St. Louis.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Prices are dollars per gross ton, including broker's commission, delivered at consumer's plant except where noted.

OPEN HEARTH AND BLAST FURNACE GRADES

	—Heavy Melting—		No. 1	—Bundles—			Machine Shop	Mixed Borings,	Short Shovel	Cast Iron
	No. 1	No. 2	Busheling	No. 1	No. 2	No. 3	Turnings	Turnings	Turnings	Borings
Pittsburgh	32.50	32.50	32.50	32.50	32.50	32.50	27.50–28.00	27.50–28.00	29.00–29.50	28.50–29.00
Philadelphia	31.50	31.50	31.50	31.50	31.50	29.50	24.00	24.00	24.00	24.00
Chicago	30.00	30.00	30.00	30.00	30.00	28.00	25.00	25.00	27.00	26.00
Cleveland	30.00–32.50	30.00–32.50	30.00–32.50	30.00–32.50	30.00–32.50	28.00–30.50	24.00–24.50	25.00–25.50	25.00–25.50	25.00–25.50
Cincinnati	29.50	29.50	28.50	29.50	29.00	....	22.50	21.00	24.00	22.50
•Boston	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	23.00–24.00	19.00–20.50	17.35–17.85	21.00–22.50	17.35
‡New York	30.00	30.00	30.00	30.00	30.00	28.00	21.50–22.00	21.50–22.00	23.50–24.00	....
Buffalo	32.00–34.00	30.00–32.00	30.00–32.00	30.00–32.00	30.00–32.00	28.00	19.50	19.50	22.00	20.50
‡Detroit	27.00–27.50	....	27.00–27.50	27.00–27.50	27.00–27.50	25.00–25.50	20.00–20.50	20.00–20.50	22.00–22.50	22.00–22.50
Valley	32.50	32.50	....	32.50	....	....	26.50–27.00	....	27.50–28.00	27.50–28.00
Mansfield	....	....	....	....	....	....	26.00	....	28.00	....
St. Louis	28.25–28.75	28.75	....	....	....	....	23.25–23.75	....	23.25–23.75	....
Birmingham	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	20.00–20.50	14.50–15.00	14.50–15.00	16.50–17.00	15.50–16.00
San Francisco	19.50	19.50	19.50	19.50	19.50	10.00	8.00	....	....	....
Seattle	19.00	19.00	19.00	19.00	19.00	17.00	11.50	11.50	....	....
Los Angeles	16.50	15.50	....	14.50	14.50	....	8.00	8.00	....	....

ELECTRIC FURNACE, FOUNDRY AND SPECIAL GRADES

	Bar Crops and Plate	Cast Steel	Punchings and Plate Scrap	Electric Furnace Bundles	Heavy Turnings	Alloy Free Turnings	Cut Structural and Plate Scrap 1 ft and under	Cut Structural and Plate Scrap 2 ft and under	No. 1 Chemical Borings	Tin Can Bundles
Pittsburgh	35.00–36.00	37.00–37.50	37.00–37.50	35.00–36.00	32.00–33.00	29.00–29.50	35.00–36.00	35.00–36.00	32.00–35.00	28.50–29.50
Philadelphia	35.00–36.00	35.00–36.00	35.00–36.00	35.00	33.00–33.50	....	36.00	36.00	31.50–32.00	....
Chicago	31.50–35.00	31.50–35.00	31.50–35.00	31.50–35.00	28.50–31.00	....	31.50–35.00	31.50–35.00	....	....
Cleveland	35.00	35.00	35.00	32.50	30.00–32.50	27.00	34.50	34.50	27.00	....
•Boston	29.35	29.35–29.85	29.35–29.85	29.35	26.35	25.35	28.85	28.85	25.85	....
‡New York	....	....	30.00	30.00–31.00	....	....	30.00	30.00	23.00–24.00	....
Buffalo	....	27.00	30.00–31.00	28.50	22.50	23.00	28.50	28.50	22.75	....
‡Detroit	....	....	28.50–30.50	30.50	....	....	....	....	....	....
Birmingham	24.50–25.00	24.50–25.00	24.50–25.00	....	....	....	24.50–25.00	24.50–25.00	....	....
San Francisco	18.00	18.00	....	....	....	8.00	20.50	20.00	....	17.00
Seattle	....	....	21.50	....	....	....	21.50	21.50	....	....

STEEL GRADES OF RAILROAD ORIGIN

	No. 1 Heavy Melting R.R. Steel	Railroad Malleable	Axles	Rails — Rerolling	Rails — Random Lengths	Rails — Cut 3-ft and under	Cut 18-in. and under	Railroad Specialties	Uncut Tires	Angles, Splice Bars
Pittsburgh	32.50	41.50–42.00	40.00–41.00	38.00–39.00	38.00–39.00	41.50–42.50	42.00–43.00	36.00–37.00	36.00–37.00	38.00–39.00
Chicago	31.00	....	....	38.00–39.00	37.00–38.00	40.00–41.00	41.00–42.00	36.50		37.00
Cleveland	32.00	45.00	....	35.00–36.00	38.00–39.00	39.00	39.00	30.50	36.50	28.50
Cincinnati	29.50	35.00	....	36.00	36.00	....	40.00	....		....
Valley	32.50	....	....	....	....	....	....	....		....
St. Louis	....	40.00–41.00	....	34.00–37.00	33.00–35.00	37.00–45.00	....	....	29.00–33.00	36.00–37.00
Birmingham	23.00–23.50	....	....	25.50–26.00	24.00–24.50	26.50–27.00	27.50–28.00	....		25.50–26.00
San Francisco	....	....	26.50	....	21.00	....	....	....	23.00	....
Seattle	20.00	27.50	....	....	20.00	....	....	....	....	21.50

CAST IRON GRADES

	No. 1 Cupola Cast	Charging Box Cast	Heavy Breakable Cast	Stove Plate	Unstripped Motor Blocks	Malleable	Brake Shoes	Clean Auto Cast	No. 1 Wheels	Burnt Cast
Pittsburgh	42.00–43.00	40.00–41.00	35.00–36.00	39.00–40.00	38.00–39.00	41.50–42.00	33.00–34.00	43.00–44.00	40.00–41.00	35.00–36.00
Philadelphia	44.00–45.00	42.50	42.50	....	41.00	45.00	....	44.00–45.00	43.00	....
Chicago	40.00–45.00	....	....	....	....	40.00–45.00	....	35.00–40.00	....	....
Cincinnati	40.00	30.00	32.00	28.00	30.00	....	28.00	40.00	....	....
•Boston	42.00–44.00	36.00–38.00	35.00–37.00	36.00	....	34.50	40.00–41.00	....	38.00–40.00	....
‡New York	39.50–40.00	37.50–38.00	....	....	....	....	....	....	....	....
Buffalo	35.00–40.00	31.00–35.00	....	33.00–38.00	....	34.00–38.00	....	38.00	32.75–33.25	....
‡Detroit	35.00–37.00	....	28.00–30.00	....	....	....	....	35.00–37.00	....	....
•St. Louis	35.00–37.00	30.00–35.00	30.00–32.00	29.00–34.00	....	....	28.75–31.00	35.00–37.00	34.50–36.50	25.00–30.00
Birmingham	30.00	....	25.00	28.00	25.00	27.50	22.75	27.50	27.00	....
Seattle	27.50	22.50	21.50	25.50	21.50	27.50	27.50	27.50	24.00	....
Los Angeles	30.00	....	....	....	....	....	....	....	....	....

• For shipping point; † fob tracks; ‡ dealers buying prices, fob shipping point; § nominal; •• fob dealers yard.

NONFERROUS METAL PRICES

Copper: Electrolytic, carlots 19.50c-20.50c, del. Conn.; Lake, 19.62½c, del. Conn. Dealers may add ¾c for 5000 lb to carload; 1c, 1000-4999 lb; 1½c, 500-999 lb; 2c, 0-499 lb. Casting, 19.25c, refinery, 20,000 lb or more; 19.50c, less than 20,000 lb.

Brass Ingot: 85-5-5-5 (No. 115) 20.50c; 88-10-2 (No. 215) 24.75c; 80-10-10 (No. 305) 23.50c; No. 1 yellow (No. 405) 16.25c; carlot prices, including 25c per 100 lb freight allowance; add ¼c for less than 20 tons.

Zinc: Price western 10.50c, brass special 10.75c, intermediate 11.00c, E. St. Louis; high grade 11.50c, del., carlots. For 20,000 lb to carlots add 0.15c; 10,000-20,000 lb 0.25c; 2000-10,000 lb 0.4c; under 2000 lb 0.50c.

Lead: Common 12.80-12.85c, chemical 12.90c, corroding 12.90c, E. St. Louis for carlots.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lb and over; add ½c 2000-9999 lb; 1c less through 2000 lb.

Secondary Aluminum: Piston alloy (No. 122 type) 17.00c; No. 12 foundry alloy (No. 2 grade) 16.50c; steel deoxidizing grades, notch bars, granulated or shot: Grade 1 (95-97½%) 17.00c; grade 2 (92-95%) 16.25c; grade 3 (90-92%) 15.75c; grade 4 (85-90%) 15.50c. Above prices for 30,000 lb or more; add ¼c 10,000-30,000 lb; ½c 5000-10,000 lb; ¾c 1000-5000 lb; 1¼c less than 1000 lb. Prices include freight at carload rate up to 75c per 100 lb.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lb) 20.50c per lb, carlots; 22.50c 100 lb to c.l. Extruded 12-in. sticks 34.00c-38.00c.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lb, 1½c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straights), 70.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05% max. arsenic, 69.87½c; Grade C, 99.65-99.79% incl. 69.62½c; Grade D, 99.50-99.64% incl., 69.50c; Grade E, 99-99.49% incl. 69.12½c. Grade F, below 99% (for tin content), 69.00c.

Antimony: American bulk carlots fob Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 28.25c; 99.8% and over (arsenic, 0.05% max.; other impurities, 0.1% max.) 28.75c. On producers' sales add ¼c for less than carload to 10,000 lb; ½c for 9999-224 lb; and 2c for 223 lb and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.9%, base sizes at refinery, unpacked 35c lb; 25 lb pigs produced from electrolytic cathodes 36.50c lb; shot produced from electrolytic cathodes 37.50c lb; "F" nickel shots or ingots for additions to cast iron 35.50c lb. Prices include import duty.

Mercury: Open market, spot, New York, $88-$92 per 76-lb flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Berrylium-Copper: 3.75-4.25% Be, $14.75 per lb contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms $1.50 lb, del.; anodes, balls, discs and all other special or patented shapes, $1.55.

Cobalt: 97-98%, $1.50 lb for 550 lb (keg); $1.52 lb for 100 lb (case); $1.57 lb under 100 lb.

Gold: U. S. Treasury, $35 per ounce.

Indium: 99.9%, $2.25 per troy ounce.

Silver: Open market, N. Y. 70.75c per ounce.

Platinum: $58-$61 per ounce.

Palladium: $24 per troy ounce.

Iridium: $110 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass products prices based on 19.50c, Conn., for copper. Freight prepaid on 100 lb or more.)

Sheet: Copper 30.93c; Yellow brass 27.53c; commercial bronze, 95% 31.07c, 90% 30.56c; red brass, 85% 29.53c, 80% 29.02c; best quality 28.44c; Everdur, Duronze, Herculoy or equiv., cold-drawn, 35 79c; nickel silver, 18%, 39.82c; phosphor bronze, grade A, 5%, 48.82c.

Rods: Copper, hot rolled 27.28c, cold drawn 28.28c; yellow brass, free cutting, 22.28c, not free cutting 27.22c; commercial bronze, 95% 30.76c, 90% 30.25c; red brass, 85% 29.22c, 80% 28.71c; best quality 28.13c.

Seamless Tubing: Copper 30.97c; yellow brass 30.29c; commercial bronze 90% 32.97c; red brass 85% 32.19c, 80% 31.68c; best quality brass 30.85c.

Copper Wire: Bare, soft, fob eastern mills, carlots 25.52c, less carlots 26.02c; weatherproof, fob eastern mills carlot 26.42c, less carlots 26.92c; magnet, delivered, carlots 28.93c, 15,000 lb or more 29.18c, less carlots 29.68c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lb or more del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers: Full sheets 16.25c, 140 sq ft rolls; add per hundredweight, 25c, 80 to 140 sq ft; 50c, 20 to 80 sq ft; 75c, 10 to 20 sq ft.
Pipe: Full coils 15.50c; cut coils 15.75c.
Lead Traps and Bends: List plus 38%.

Zinc Products: Sheet, 15.50c-15.75c, fob mill, 36,000 lb and over. Ribbon zinc in coils, 14.50c-14.75c, fob mill, 36,000 lb and over.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads, 20.00c; 5 tons and over, 25.00c; 1 to 5 tons, 21.00c; less than 1 ton, 21.50c.

Copper Anodes: In 500-lb lots, fob shipping point, freight allowed, cast oval, over 15 in., 36.87½c; flat untrimmed, 36.87½c; electro-deposited, 30.62½c.

Copper Carbonate: 52-54% metallic Cu, 250 lb barrels, nom.

Copper Cyanide: 70-71% Cu, 100-lb kegs or bbls, 41.50c fob Niagara Falls.

Sodium Cyanide: 96-98%, ½-oz balls, in 100 or 200 lb drums, 1 to 400 lb, 16.00c, 500 lb and over, 15.00c, fob Cleveland; 1 cent less, fob Niagara Falls.

Nickel Anodes: Cast and rolled carbonized, carloads, 48.00c; 10,000 to 30,000 lb, 49.00c; 30,000 to 10,000 lb, 50.00c; 500 to 3000 lb, 51.00c; 100 to 500 lb, 53.00c; under 100 lb, 56.00c; add 1 cent for rolled depolarized.

Nickel Chloride: 100-lb kegs, 22.00c; 275-lb bbls, 22.00c.

Tin Anodes: Bar, 1000 lb and over 82.50c; 500 to 1000 lb, 83.00c; 200 to 500 lb, 83.50c; less than 200 lb, 84.00c; ball, 1000 lb and over, 84.75c; 500 lb to 1000 lb, 85.25c; 200 to 500 lb, 85.75c; less than 200 lb, 86.25c, fob Sewaren, N. J.

Tin Chloride: 400 lb bbls, nom., fob Grasselli, N. J.; 100 lb kegs, nom.

Sodium Stannate: In 100 or 200 lb. drum, 49.00c; 4 to 11 kegs, 47.00c; 12 to 20 kegs, 44.30c; 21 kegs and over, 43.50c; in 350-lb bbl, 46.50c; 4 to 5 bbls, 43.80c; 6 bbls and over, 43.00c; fob Chicago, freight allowed east of Mississippi on 100 lb and over.

Zinc Cyanide: 100-lb drums, 35.00c, fob Cleveland; 34.00c, fob Niagara Falls.

Scrap Metals

BRASS MILL ALLOWANCES

Prices for less than 15,000 lb fob shipping point. Add ¾c for 15,000-40,000 lb; 1c for 40,000 or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	17.125	17.125	16.375
Yellow brass	13.750	13.250	12.875
Commercial Bronze			
95%	15.875	15.625	15.125
90%	15.750	15.500	15.000
Red brass			
85%	15.500	15.250	14.750
80%	15.375	15.125	14.625
Best Quality (71-79%)	14.625	14.375	.....
Muntz metal	12.875	12.625	12.125
Nickel silver, 5%	14.500	14.250	7.250
Phos. bronze, A. B.	18.125	17.875	16.875
Naval brass	13.250	13.000	12.500
Manganese bronze	13.250	13.000	12.375

BRASS INGOT MAKERS' BUYING PRICES

(Cents per pound, fob shipping point, carload lots)

No. 1 copper 17.00, No. 2 copper 16.00, light copper 15.00, composition red brass 16.00, auto radiators 13.00, heavy yellow brass 11.50, brass pipe 12.00.

REFINERS' BUYING PRICES

(Cents per pound, delivered refinery, carload lots)

No. 1 copper, 18.75c; No. 2 copper, 17.25c; light copper, 16.25c; refinery brass (60% copper), per dry copper content, 15.00-15.25c.

DEALERS' BUYING PRICES

(Cents per pound, New York, in ton lots or more)

Copper and Brass: Heavy copper and wire, No. 1 15.50-16.00; No. 2 14.50-15.00; light copper 13.50-14.00, No. 1 composition red brass 14.00-14.50, No. 1 composition turnings 13.00-13.50, mixed brass turnings 9.50-10.00, new brass clippings 13.00-13.50, No. 1 brass rod turnings 11.75-12.25, light brass 8.00-8.50, heavy yellow brass 10.00-10.50, new brass rod ends 12.00-12.50, auto radiators, unsweated, 11.00-11.50, clean red car boxes 12.50-13.00, cocks and faucets 11.75-12.00, brass pipe 11.50-11.75.

Lead: Heavy lead 11.25-11.50, battery plates 6.50-6.75, linotype and stereotype 13.50-14.00, electrotype 11.50-12.00, mixed babbitt 12.00-12.50, solder joints 13.50-14.00.

Zinc: Old zinc 5.50-6.00, new die cast scrap 5.50-6.00, old die cast scrap 4.00-4.50.

Tin: No. 1 pewter 44.00-45.00, block tin pipe 60.00-62.00, auto babbitt 35.00-36.00, No. 1 babbitt 35.00-38.00, siphon tops 38.00-40.00.

Aluminum: Clippings, 2S, 9.50-10.00, old sheets 7.50-7.75, crankcases 7.50-8.00, turnings 4.00-4.25, pistons, free of struts, 6.75-7.00.

Nickel: Anodes 19.50-20.50, turnings 16.50-17.50, rod ends 19.00-20.00.

Monel: Clippings 14.00-15.00, turnings 9.00, old sheet 12.00-13.00, rods 12.50-13.00, castings 10.00.

Extras on Carbon Cold-Rolled Strip Steel Revised Upward . . Demand Continues Heavy

(*Concluded from Page 67*)

clusive. These size ranges are now combined.

Widths over 6-in. for thickness 0.161-in. and thicker formerly carried no size extra for "hard" tempered coils; now an extra of $1.15 per 100 pounds is charged over 6 to 12-in. wide inclusive, and $1.05 over 12-in. Size extras for cut lengths 24-in. and longer also have been increased up to $1.15 in heavier gages, and there is one series of extras for width range over 12 to 23⅛ inch.

Extra for bright finish has been advanced from 75 cents to $1.50 per 100 pounds. Procedure for charging extras for special weight coils has been completely revised, with addition of new width ranges.

New packaging, boxing and wrapping extras are established. Packaging extras now apply for quantity ranges 9999 to 6000 pounds per skid; 5999 to 4000; 3999 to 2000; and 1999 to 1000 pounds. Minimum skidding charge is $4 per 100 pounds for bare skids; $5 for shrouded. An extra of 10 cents per 100 pounds is charged for coils in lifts 4000 to 6000 pounds. A boxing extra of 75 cens per 100 pounds is charged for boxes containing 500 pounds or more of a size and kind; $1.25 for 499 to 250 pounds; $2.25 for 249 to 100 pounds; minimum charge is $2.50 per order or item. A wrapping extra of 25 cents is charged for coils papered, single wrapped; 40 cents double wrapped. Interleaved single wrapped the extra is 30 cents; double wrapped, 45 cents. Details on new drawing quality and quantity extras are not yet available on cold-rolled strip.

Gage extras for electrical sheet coils and cut lengths have been increased 5 to 30 cents in gage range from 25 to 30. Gage extra for 25 gage is up 5 cents to 15 cents; gages 26, 27 and 28 advanced 10 cents to 30, 40 and 50 cents, respectively. An increase of 15 cents to 65 cents is established for 29 gage; and 30 cents to 90 cents for 30 gage. The width extras have been brought in line with popular thicknesses, and to correlate with core plating extras so that all thickness ranges are constant. The width and length ranges also are revised in keeping with present day production methods.

Order quantity extra for less than 7000 pounds has been increased from 25 to 50 cents. Formerly, item quantity extras were applicable in ranges under 1500 pounds; these have been increased and revised as follows: 9999 to 6000 pounds, no charge; 5999 to 4000, 20 cents; 3999 to 2000, 50 cents; 1999 to 1000 pounds, $1; under 1000 pounds, $1.50.

Previously there was a flat oiling extra of 10 cents regardless of thickness, now these extras are applicable on lighter gages as follows: 17 gage and heavier, 10 cents; 18 to 21 gage, 15 cents; 22 to 24 gage, 20 cents; 25 to 27 gage, 25 cents; 28 to 30 gage, 30 cents.

Coiling extra of 25 cents heretofore applying for coils under 24 inches wide now apply for all widths.

Pickling before annealing extras for field, armature and electrical grades have been established as follows: 17 gage and heavier, 30 cents; 18 to 21 gage, 40 cents; 22 to 24 gage, 50 cents; 25 to 27 gage, 60 cents; and 28 to 30 gage, 75 cents. An extra of 25 cents is charged for one pass cold roll, after annealing and core loss testing, to surface harden; applicable to armature and electrical grades. An elaborate new schedule of packaging extras also has been established, conforming with those recently announced in hot and cold-rolled sheet extra cards.

Empire Steel Corp. has established price base on field grade electrical sheets at $4.20 per 100 pounds, Pittsburgh. Kokomo, Ind., is reported to have been established as a basing point on field, armature and electrical grades at 10 cents above Pittsburgh price base. The arbitrary Pacific ports and Gulf coast prices on electrical sheets have been discontinued, with prices now based Pittsburgh, plus rail and ocean rate and arbitrary marine insurance, dock handling and switching charges which vary at major ports.

Boston — Without exception metal-working industries consuming narrow cold-rolled strip are clamoring for more tonnage with prospects slim for increased quotas in the second quarter. Users of light gage hot-rolled sheets are confronted with the same stringency. First easing is looked for in 12 gage and heavier sheets, but not before mid-summer. Spot-lighting demand for sheets in this area is the increase in requirements for specialty grades. Electrical, enameling and elecro-galvanized. Overall average advance in electrical sheets is estimated at $10 a ton to consumers. Drawn-out shortage of hot-dipped galvanized sheets has opened markets for electro-galvanized, outdoor billboard structures being one among many. Indications based on prospective hot-rolled schedules are narrow cold-rolled strip supply will be limited through balance of the year with rerolling programs subject to frequent adjustments.

Birmingham — Sheet users continue their pressure for delivery but they are not being met in hoped for quantity. Some users of sheets, especially in areas contingent to the Birmingham district, are said to be faring better generally, but not much improvement in the overall supply is indicated for a while, at least.

Cincinnati—Sheet mills are well into the task of setting the second quarter schedules, preliminary surveys indicating allotments will be greater than in the first quarter. Conditions and developments in the fourth quarter imposed handicaps on mills which are currently being modified or eliminated. Demand shows no sign of relaxing and mills are still refusing delivery positions through the entire year.

Sheets, Strip . . .

Sheet & Strip Prices, Page 172

Chicago—Mills are now noting considerable activity among their customers to alter purchasing practices to minimize higher materials cost imposed upon them recently through the new extras made effective with the higher base prices. Few actual changes have occurred in buying practices as yet, but the trend is developing and likely will reach major proportions shortly. One sheet consumer has found that the extras and higher base price have increased his cost of sheets by $50 a ton.

New York—Except for a few miscellaneous specialties, prices on sheet products now have been revised fully. There is still considerable confusion in the trade with respect to certain extras, but this is ironing itself out gradually. Meanwhile, buyers are still active in revising specifications wherever possible so as to lessen the burden of the new extra schedules, and in this mills are cooperating fully.

Sheet sellers generally—at least those selling on a quarterly basis, as the great majority do—are expected to announce quotas for second quarter of their customers within a few days. A couple are already reported to be taking such action.

Some black market material continues to be offered here at prices far above mill and regular warehouse levels. Some spot tonnage of 26-gage galvanized sheets has been offered here at 25 cents a pound, as compared with a mill price of 5 cents.

Philadelphia—Sheet sellers generally have not yet announced quotas for second quarter, and at least one large producer may not before the middle of this month. However, it would not prove surprising if several will take action this week. Indications are that customer quotas will be somewhat heavier than in the current quarter, although far short of requirements. One large mill has indicated that in opening books for next quarter, it will not accept any new tonnage for shipment in April. At least one or two producers doubt if they will have any larger quotas for second quarter than they have for the present quarter, because of production difficulties.

The new 54-inch mill at Sparrows Point, Md., has started production, but on a very limited scale, and it is considered doubtful if it will get into full swing for some months to come because of lack of hot bands. This unit was counting on bands from a new 66-inch hot mill at that point, but construction has been considerably delayed because of inability to obtain electrical equipment according to schedule. It now appears that this hot mill will not get into production before next year.

Detroit Delivered Prices For Steel Products Revised

Detroit—Arbitrary delivered prices to this city have been increased from 13½ to 15 points over principal basing point prices on carbon and alloy blooms, billets and slabs; hot-rolled and cold-finished alloy bars; hot-rolled carbon bars; hot-rolled and cold-finished sheets and strip; and enameling sheets. Arbitrary delivered prices to eastern Michigan and Toledo have been increased from 18½ points to 20 points on the same products. The former arbitrary delivered price differentials to these districts had been in effect since July 1, 1946.

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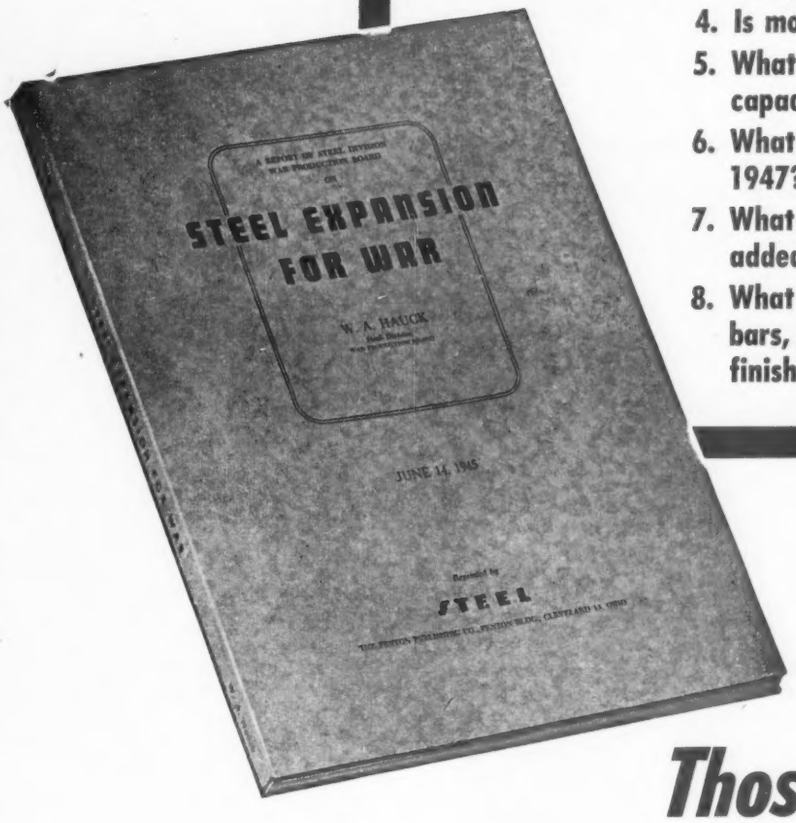

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Steel Bars . . .

Hope rising that supply of carbon bars will ease somewhat next quarter

Bar Prices, Page 172

Pittsburgh—Under new pricing policy sellers are making thorough study of bar size ranges produced at various price bases. In announcing higher prices to trade producers were specific in limiting the action to range of sizes produced with understanding competition would be met for only the size ranges produced by competitors at same price base or other production points. It is pointed out that the range of sizes varies at almost every production center.

The "killed" steel extra has been clarified by Carnegie-Illinois Steel Corp. as follows: All rounds, squares and hexagons 3-in. in diameter or greater, or of equivalent cross section, plus flats of 12 sq in. in cross section or greater will be sold only as killed steel. Steels to be quenched or carburized must be a fully killed steel; any steel specifying a carbon content exceeding 0.75 maximum is in same category. Generally, any steel used for forgings with carbon content of 0.15 minimum or greater must be specified as "killed".

New York—As carbon bar sellers will enter the second quarter with substantially less arrearages than at the beginning of the current period, hope is gaining ground among consumers that their allotments for next quarter will be somewhat larger. Supply may be a little freer in cold-drawn bars, for the reason that there is not quite the pressure that there was late last year. However, it appears that in the small sizes of both hot and cold-drawn bars supply will be far short of demand. Anything from 1-½ inches down will likely continue scarce. Alloy shipments remain comparatively easy, with hot alloy still available for shipment before the end of March.

Boston—Where carbon bar second quarter allocations are slightly higher, the increase centers in larger sizes, generally two-inch and over. On large rounds, heavy flats and squares, warehouses and most consumers are already long with demand lagging. Alloys and stainless are relatively easy. Small sizes of hot-rolled carbon bars make up the bulk of mill backlogs and users will get no increase in this tonnage in second quarter. Some bar orders, notably warehouse, are being revised to avoid extras, but the extent this can be done is limited by application and use by forge, machine and other fabricating shops. Substantial part of the bar tonnage requires carburizing, machining or some metallurgical practice for which revision in basic specifications is difficult. While the current over-loaded backlog in small sizes would raise doubts, numerous consumers look for first definite easing in supply of major carbon steel products to appear in bars.

Philadelphia—Carbon bar sellers are beginning to set up quotas for next quarter, although action on the part of some of the larger sellers still remains to be taken. On cold drawn carbon bars action is fairly general, and on alloy bars there hasn't been any question about the acceptance of tonnage for next quarter, because of ample capacity. Hot alloy bars, in fact, are still being accepted for shipment before the close of this quarter.

Seattle — Local rolling mills are operating steadily and have reduced backlogs, although unfilled orders still involve considerable volume. Demand continues active but new business is confined to emergency orders and the needs of regular customers. Sales executives are now adjusted to the new price schedules which at first caused some confusion. One plant is refusing all merchant bar orders except plain rounds.

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Plates . . .

Plate Prices, Page 173

New York—Persistent demand continues for plates, with one eastern mill now practically out of the market for the remainder of this year. This interest is still booking some tonnage on a highly selective basis for fourth quarter, but is said to have little capacity left. Certain other mills are booked throughout the greater part of third quarter and could easily obtain shipment beyond were they so disposed. Some leading producers, however, are quoting on a quarterly basis and should be announcing their quotas for next quarter soon.

Except for ship work, which is lagging badly as has been generally expected, regular plate-consuming groups appear to be pressing for tonnage on a larger scale than heretofore. Car builders, tank

manufacturers and various heavy equipment builders are ordering heavily, although they are getting far less tonnage than desired. In the case of railroad equipment builders, a special effort is being made to facilitate shipments, but it may be second quarter before there is any appreciable increase in the tonnage set aside for these consumers. Ship work, incidentally, is being confined almost entirely to repair and reconversion jobs.

While building construction requirements have been lagging somewhat of late due to government restrictions and to uncertainties as to costs and to deliveries on raw materials and various building components, the outlook is for expansion on a substantially larger scale over the next few months.

Boston—Not until supply of plates more nearly balances heavy demand will the current range of prices paid by New England fabricators be clarified. That time is conjectural, but by mid-third quarter competition for tonnage may bring about a price test. Including extras and freights, plate shops are paying close to $15 per ton higher for plates, more from warehouses, and fabricators are likely to bear down on costs at the first opportunity. Shortage of this product, notably in lighter gage tank quality, will continue through second quarter, and in numerous cases shops are unable to reach planned production levels because of lack of plates. Second quarter production on delinquent tonnage will be substantial, and the carbuilding program will take a deep bite into plate output. Including plates, universal especially, total steel requirements for cars by fourth quarter is estimated at nearly two million tons. Demand for floor plates is holding surprisingly well.

Pittsburgh—Under new pricing policy producers are meeting competition at various price bases for only size ranges of plain plate produced at each point. At Youngstown the maximum width is 72 inches by 5/16-in. thick; Cleveland, 90 inches wide by 3/4-in.; at Birmingham up to 128 inches wide. Geneva price base covers only limited sizes, grades, lengths, etc., now produced. Universal plate, 10 inches and narrower, are not recognized as price based at Sparrows Point, Claymont or Coatesville.

Demand for plate remains very active, with fabricators 4 to 6 months behind production schedules due to continued tight supply. Fabricators report a slight easing in new inquiries due to inability in most instances to make deliveries until late this year.

Birmingham—Steel mill interests declare the situation in plates remains stringent. There are indications of slight let up in the overall backlog picture, but current demand continues to outpace supplies. A marked demand for some of the lighter gages in plates is evident while the needs of shipbuilding and repairing and car production holds unabated.

Seattle — Plates are in strong demand but shops are handicapped by inadequate mill shipments. Only small jobs, mainly tanks and boilers, are being booked. Operations would be much heavier were supplies available.

Business pending includes an unstated tonnage for treatment tanks and retorts for proposed plant at Everett for American Lumber & Treating Co., Chicago, bids to Seattle, Feb. 14.

Tin Plate . . .

Tin Plate Prices, Page 173

Chicago—Although tin plate facilities in this district are being operated at capacity, demand continues at such a heavy pace that individual requirements fall short of being met. Fact that canmakers are finding it necessary to ration cans to their customers indicates that shortages exist in finished containers as well as canmaking materials. The shortage of box cars remains a matter of concern to tin plate producers, but the railroads manage to furnish sufficient cars to keep shipping docks clear, although production must be piled at intervals.

Pittsburgh—Tin mill product output has held up very well the last few weeks, with practical capacity output sustained by all producers. However, there is some doubt tin plate capacity, even taking into account new production facilities scheduled to be brought in later this year, will be adequate to meet overall requirements. Current product mix in specifications against first-quarter commitments is reported satisfactory. With beer, coffee and other products now permitted to be packaged in tin plate containers, electrolytic tin plate requirements are expanding, and it will take a little time before expected balance in volume between electrolytic and hot-dipped is reached. Tin plate export quotas this quarter have been firmly set at 195,000

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tons, and an additional 40,000 tons must be scheduled for April and 25,000 tons for May delivery. Office of International Trade hoped to have the first-quarter mill export load further increased, but the Agricultural Department opposed this on basis deliveries to domestic consumers already on mill books would have to be curtailed.

Wire . . .

Rod shortage hampers wire mills with demand for wire products continuing unabated

Wire Prices, Page 173

New York—Demand for wire continues in excess of supply, except in scattered products. Alloys, welding wire and stainless are relatively easy, but most carbon grades used by the manufacturing trade are extended into second quarter and beyond on some grades. Supply of rods tightens as integrated mills draw a larger percentage into finished wire. Some consumers using two or more grades are unbalanced as to inventories. Bedding manufacturers, for instance, have deferred on so-called border wire until stocks of spring wire are heavier. Steel wool manufacturers expect to pass on substantial advances in wool wire to industrial consumers without much difficulty, but are meeting with stubborn resistance from the domestic household field, the latter turning to substitutes. Except on a few minor items, Washburn Wire Co. has gone on a New York base and more wire products are also based at Trenton, N. J.

Boston—Wire mills are well into second quarter and beyond on numerous products with nonintegrated producers hampered by uncertain rod supply. Practically no progress is made against backlogs and pressure for tonnage by consumers is unabated. Rods suitable for music and spring wire drawing are notably short as rod mills roll a higher ratio into finished wire. This, coupled with geographical selectivity, makes for uncertain semifinished supply. Some, but not much, Swedish semifinished steel is available. At least one Worcester district mill has limited tonnage for valve springs, but the total is not enough to influence the overall production situation. As a matter of fact, some eastern producers have inquiries from Sweden for finished wire. Domestic wire mills took full advantage of the stoppage in Swedish imports for nearly four years by improved metallurgical practice, notably for valve and spring wire and razor blade steel, and are coddling their new outlets. Pressure for wire tonnage by the automotive interests and suppliers is strong and clockmakers are again calling for high-carbon stock. Clock spring wire is an important item in Connecticut.

Pittsburgh—Confusion still prevails on matter of price bases for specific range of sizes, finishes, etc. for merchant and manufacturers wire items. Price base at Cleveland has been dropped on merchant wire products except wire manufactured in that producing district. Pittsburgh Steel and Jones & Laughlin Steel Corp. are no longer shipping directly into Chicago and Worcester on merchant items. In general mills are revising product distribution pattern to avoid as much freight absorption as possible, with some interests withdrawing from some major consuming areas while others are meeting competition only to extent of size ranges produced at these centers. Nonintegrated interests have advanced fine weaving wire to $5.95 per 100 pounds; spring wire, to $4.60.

Birmingham—Somewhat more obtainable are certain items in wire, notably fencing and nails, although far from average in supply. Wire processors are not being supplied in needed and anticipated quantities, although the general opinion is that there has been a slight easing. Mills continue on self allocation basis in most instances.

Structural Shapes . . .

Structural Shape Prices, Page 173

New York — Structural bookings for 1946, according to the American Institute of Steel Construction, amounted to 1,726,057 tons, an increase of 14 per cent over the average of 1,509,496 tons for the same period in the five prewar years, 1936-1940. December bookings amounted to 96,601, the low for the year, compared with revised totals for November and October of 102,399 and 142,565, respectively, and with 235,817, the high total for the year which came in January.

Shipments for 1946 amounted to 1,551,607 tons against 1,464,626 tons, the average for the five prewar years. December shipments amounted to 142,071 tons, against revised figures for November and October of 157,274 tons and 164,730 tons. The latter figure was the highest for the year.

Tonnage available for fabrication within the next four months, according to the Institute, was 164,090 tons, compared with 363,288 tons, the average carryover for the five prewar years.

Current structural buying in the New York area continues somewhat spotty, with many builders still moving cautiously because of uncertainties as to cost and deliveries on various building materials and components, such as electrical equipment, building hardware, etc. Nevertheless, there is still quite a fair amount of work being figured.

Chicago—Fabricators in this district are much concerned over the intention of an eastern steelmaker to withdraw from this area. This company has been a supplier of considerable tonnage in this area, particularly on wide flange beams, and with steel from mills in the district having their output allocated to long-time customers, fabricators are finding it difficult if not impossible to locate new sources of supply. The recent advance in freight rates makes it undesirable for the eastern mill to absorb more cost in its effort to remain in this market. New inquiry for fabricated structural steel is exceeding light and awards are in small volume. Evidence is growing of major construction work being deferred because of high costs. Fabricators have all the work they can handle in view of short steel supply.

Boston—Bridge and power plant requirements are perking up, but high costs as reflected in unit steel bids for a Connecticut river deck plate girder span, are retarding some projects. Structural mills are spread on delivery promises, although all are over-balanced on smaller sizes with no overall easing expected on some

units before fourth quarter. Nevertheless, second quarter quotas are slightly higher with one producer. Most district fabricators have been estimating with warehouse structural prices for bulk of small lot work, although distributors are limited in their ability to finish wanted shape tonnage. Demand for special railroad car sections looms as an added load for structural mills. Manufacturing industries in Massachusetts expended $45 million in new buildings, additions and alterations last year according to a survey by Associated Industries of Massachusetts.

Philadelphia—While structural steel orders in this district continue light, demand has been enlivened somewhat by a 4500-ton inquiry for a generating station for the Philadelphia Electric Co., near Norristown, Pa., on which bids are to close Feb. 7, and several inquiries for state bridges, most of which had been up for bidding some time ago and then dropped because of inadequate appropriations.

Seattle — Fabricating shops are taking only small jobs consistent with the inadequate supply of steel. Allocations are below requirements and consequently it is inadvisable under present conditions to make commitments for major projects. Release of shipments on strike-bound vessels has relieved the situation temporarily but inventories are acutely short.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 173

Chicago—Despite the fact that numerous major construction programs are being held in abeyance because of the considerably higher costs, reinforcing steel suppliers have all the business they can handle. Short steel supply is the drawback. While large jobs are shrinking, the volume of small miscellaneous building, both new and modernization, is heavy. Northwestern University, Evanston, Ill., and Illinois University, Urbana, Ill., both having heavy building programs in prospect, have found it necessary to revise their plans, giving priority to some and sidetracking others for the present. Estimates for construction exceed appropriations by a wide margin.

Philadelphia—Reinforcing steel is difficult to obtain, although higher mill prices, as recently announced, are expected to stimulate production in this line as time goes on. Meanwhile, several fair sized inquiries are pending, including tonnage for a patients' building, Byberry State Hospital, this city, on which bids are to be opened Feb. 19.

Seattle — Demand continues active for reinforcing bars, although major projects are still in the indefinite stage in view of unexpected high construction costs. The labor situation is more settled but is an immediate problem pending negotiation for a higher wage.

Tubular Goods . . .

Tubular Goods Prices, Page 173

Pittsburgh—Tubing manufacturers report a number of requests to produce standard lighter weight pipe on tube mills, with customers willing to pay premiums up to $50 a ton. Pipe mills are booked through 1947 and into 1949 in some instances. Export tubing demand continues very heavy, but buyers

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are said to be more price conscious. Order backlogs on tube mills range between 3 and 4 months on alloy and stainless, 6 months on carbon. Price revisions on tubing have been completed except for copper bearing, high tensile-low alloy, aircraft and other specialities.

Seattle — Inquiry for tubular goods continues active but many large projects have been deferred due to long term deliveries. Current contracts are based on 1948 shipments.

H. C. Purcell, this city, has booked 155 tons of cast iron pipe for Bellingham, Wash. Business pending includes 750 tons at Spokane, Wash., and 150 tons at Wenatchee, Wash., bids in; also, an unstated tonnage for several Seattle local improvements.

Pig Iron . . .

Birdsboro producer raises prices $3 a ton . . . High silicon silvery up $2

Pig Iron Prices, Page 175

Cincinnati—High silicon silvery pig iron prices advanced $2 a ton last week to the basis of $38 a ton, Jackson, O., for 6 to 6.5 per cent grade.

Lag in pig iron shipments is not serious, but volume allotted to foundries is source of common complaint. Most melters would take, if it were available, double the current tonnage. Furnaces have not yet announced allotments for February, the current view being that little improvement in volume can be expected. Foundry coke is in adequate supply for regular customers, but ovens cannot meet all demands.

Philadelphia—The Birdsboro, Pa., pig iron producer has advanced all grades $3 a ton to $34.50, base, for No. 2 foundry, $34 for basic, $35.50 for bessemer, $35 for malleable, and $39 for low phosphorus. This follows an increase of $2 by this producer late last November, an action that was generally followed by other producers. Whether this latest advance by Birdsboro again will be followed by others, however, remains to be seen. Some leading sellers state they contemplate no immediate change.

Advance of $3 at Birdsboro has had the effect of setting up Steelton, Pa., as the governing base on low phos for delivery to this city. Hence, with Steelton base still $36 and the freight rate $2.16, the minimum delivered Philadelphia price is $38.16, compared with the former delivered price of $37.49, which was predicated on a $36 base at Birdsboro and a $1.49 freight rate.

District furnaces report they will be called upon to supply slightly less priority tonnage in February than in the preceding month, although some state that the reduction will not compensate for the loss in working time resulting from the fewer days in February. Consequently, nonrated consumers, which comprise the great majority of buyers in this district, contemplate another exceedingly tough period ahead, and one likely to be made still tougher by the upward trend in cast scrap prices. Producers again face the painful duty of telling many of their regular customers there is little they can do about the supply situation. One producer of foundry and malleable iron is now being forced to allocate 125 per cent of his average monthly production of these grades for the past five years to only 10 per cent of his regular trade.

Meanwhile, certain rated consumers are in such excellent position with regard to pig iron that they are having to buy little cast scrap. They are offering to buy cast scrap, but at a price that is well below the market with a result that they are getting only small quantities, usually scattered truck lots from nearby sources, and under the circumstances they apparently are satisfied. Their offering prices are around $41, delivered, compared with at least $44 to $45, delivered, for the general market, and even as high as $50 in some scattered instances.

While supply of by-product coke continues scarce, the fuel situation is being eased slightly by larger arrivals of beehive coke from western Pennsylvania.

New York—Pig iron sellers report that allotments of rated tonnage for February are nearly equal to those for the month just ended, with the situation further complicated by the fact that February is a short month. The net result seems to be that non-rated consumers will receive even less than in January. Some hope had been expressed by these buyers that January rated allotments would represent the peak, following as they did a month when many priority tonnages were cancelled because of a reduction in output due to the coal strike. Some believed that by February there would be a little easing in the amount of priority tonnage allocated. However, this does not seem to be the case.

Meanwhile, district foundries which are not on a rated basis, and which constitute by far the majority in this district, are experiencing extreme difficulty. Some declare that the shortage of iron is the worst in their experience. Appeals are being made not only to the Civilian Production Administration but to Congressmen in an effort to obtain some relief. It is difficult to estimate average operations of foundries doing nonrated business, but it is clear that a number are operating at well below 50 per cent, and on almost a day-to-day basis. A few foundries are down completely.

Adding to complications also is a continued shortage in coke. While the situation appeared a little easier a while ago and certainly easier than during the period when the soft coal mines were down late last year, there is still an acute shortage of coke. This is ascribed in part to lack of reserves at the producing ovens and to much heavier seasonal demands from the gas companies.

Leading Buffalo producer put a furnace into blast Jan. 30, thus giving it three furnaces now in operation.

Boston—Although supplies are spread thin with some heavier consumers needing more iron, Mystic furnace production is gradually improving supply of foundry grades. Purchase of foreign iron has supplemented textile mill equipment inventories; price paid is in the vicinity of $70, Boston. Buffalo shipments will be limited this month, but will probably be over January when little tonnage arrived from that producing area. February certified allocations are unchanged or slightly higher, around 4200 tons on Mystic. No improvement in volume

Aircraft Wire—tinned or alloy coated and galvanized
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Belt Hook Wire—tinned, galvanized or alloy coated
Bobby Pin Wire
Brush Wire—round scratch brush, tempered and untempered. High strain white liquor finish
Card Wire—tempered, round, angular, single convex, double convex
Curtain Spring Wire—round, flat
Fish Leader Wire
Flexible Shaft Wire—Music Wire quality
Hard Drawn Spring Wire
Heddle Wire
Hose Reinforcement Wire
Mandolin Wire
Music Wire, bright, tinned or alloy coated
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of basic is seen in the near future, and melters of that grade are operating on close margins; at times level of melt is endangered. The Everett furnace will make no basic under the current premium program. Foundry subcontracting holds at a substantial rate, although below the war time peak.

Lake Superior Iron Ore Prices Rise 50 Cents a Ton

Cleveland—Lake Superior iron ore prices have advanced 50 cents a ton on substantial contract sales for the 1947 season. All leading sellers in this district are quoting the higher prices which are as follows per gross ton for 51.50 per cent material at the lower lake ports: Old Range bessemer, $5.95; Old Range nonbessemer, $5.80; Mesabi bessemer, $5.70; Mesabi nonbessemer and high phosphorus, $5.55.

Scrap . . .

Prices advance in Philadelphia to basis of $31.50 for No. 1 heavy melting

Scrap Prices, Page 176

Philadelphia—Prices on steelmaking grades in this district are responding to the generally stronger tone which prevails throughout the scrap market. Delivered prices in the Philadelphia district are now at a minimum of $31.50 for Nos. 1 and 2 heavy melting steel, No. 1 busheling and Nos. 1 and 2 bundles.

With pig iron generally scarce and consumers outside the district bidding for scrap here, sentiment is strong and it is possible that even higher prices may develop. Sellers are somewhat more cautious in accepting orders, although the movement of scrap against back orders continues heavy. One leading eastern Pennsylvania consumer reported recent receipts of melting steel as the largest in many weeks, with the situation being helped by unusually mild weather for this season of the year. In fact, weather so far this winter has been generally favorable for the handling and movement of scrap.

Higher prices are also quoted for No. 3 bundles at $29.50, delivered; machine shop turnings, mixed borings and turnings, short shovel turnings and cast iron borings at $24. Low phos and specialty grades are stronger again with bar crops and plate, cast steel, and punchings and plate scrap at $35 to $36; electric furnace bundles, $35; heavy turnings, $33 to $33.50; cut structural and plate scrap, $36; and No. 1 chemical borings, $31.50 to $32.

No. 1 cupola cast is higher with the general market at $44 to $45, although in some instances still higher prices are being paid. Charging box and heavy breakable cast are now holding at $42.50, delivered; unstripped motor blocks, $41; clean auto cast, $44 to $45; and No. 1 wheels, $43.

New York—Brokers here have advanced their buying prices to $30, fob shipping point, on Nos. 1 and 2 heavy melting steel, No. 1 busheling, Nos. 1 and 2 bundles. They are paying $28 for

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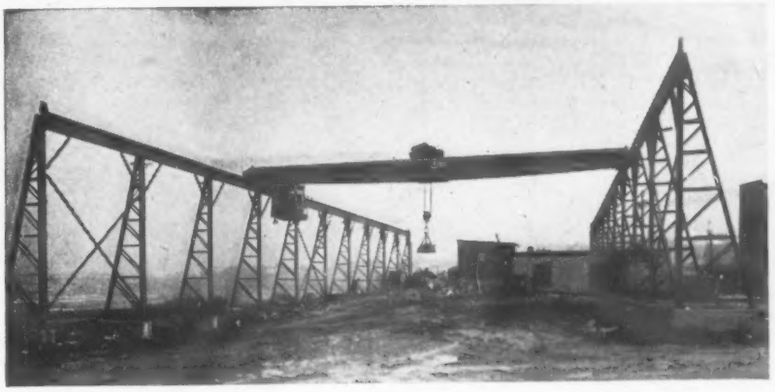

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No. 3 bundles, $21.50 to $22 for machine shop turnings and mixed borings and turnings, and $23.50 to $24 for short shovel turnings.

Punchings and plate scrap are strong at $30, electric furnace bundles at $30 to $31, and cut structural and plate scrap at $30. There has been no recent change in the cast iron grades and the local market on No. 1 chemical borings has eased to around $23 to $24.

Further increases in the melting steel grades have placed the brokers' buying market here at higher levels for the third consecutive week and reflect particularly heavy pressure for tonnage in the Pittsburgh area.

Pittsburgh—Local mills are not pressing for scrap tonnage, reflecting fairly good inventories and concerted effort to stabilize prices. Mills are using greater proportion of hot metal in open hearths which has helped offset general tight scrap supply situation. For scrap purchased in this area, mills continue to set a ceiling at $32.50 per ton for open-hearth grades; however, some scrap is being brought into Pittsburgh under special deals at substantially above this figure. The market in New England, for example, is around $28.50 per ton, which means that under these special deals the mills must absorb $7.73 freight in bringing scrap here, or a delivered price of $36.73 including brokers commission. The market at Buffalo is $32.50, making scrap from that area delivered Pittsburgh of $37.24, including commission and $4.24 freight.

Cast scrap supply is somewhat more plentiful based on tonnage offered here recently at price range of $42 to $43, delivered, for No. 1 cupola cast. A number of foundries continue out of the market due to high cast scrap prices. No substantial improvement in supply of steelmaking grades is indicated until spring, with distribution of limited supply of production scrap continuing on allocation basis to specific mills for reciprocity reasons.

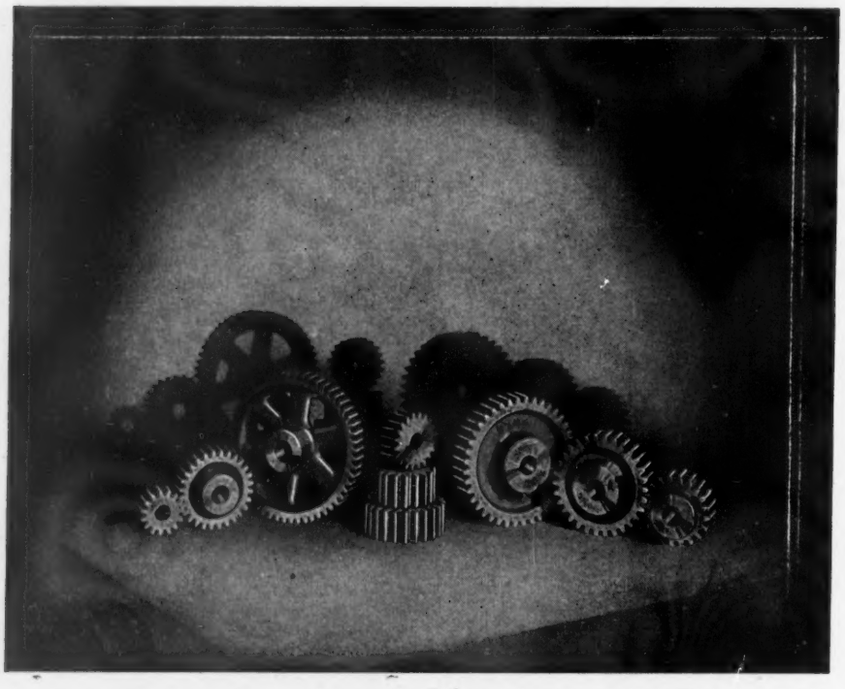
Railroad heavy melting steel appears stabilized at $32.50 per ton, with normal differentials for specialties.

Chicago—Somewhat higher prices for open-hearth scrap in certain Eastern districts has not affected this market. The price of $30 holds steady here in spite of extremely heavy demand. Flow of material is in good volume, but still falls short of melting requirements. For the third straight week, steelmaking operations are at 90 per cent of capacity, a figure which is dependent solely on combined supply of scrap and blast furnace hot metal. Output of the latter is at full capacity; thus, scrap is the variable. In many respects, conditions in this district are becoming fairly well stabilized.

Boston — Advances in steelmaking grades of scrap are overcoming resistance of district consumers, who, while in need of tonnage, are striving to halt the upward trend by keeping out of the market as long as possible. Scrap prices are far out of line with pig iron in both steelmaking and foundry grades. That full advantage is being taken of current conditions is not setting too well with purchasing departments. Heavy melting steel has moved up $1.50 to $2 a ton on the basis of outside sales. Cast is strong but unchanged at the wide spread of $40 to $45, delivered. Stove plate holds around $39, delivered. The current situation as to raw materials for foundry melting is paradoxical, New England consumers are paying the lowest price in the country for pig iron, but are on a limb as regards scrap.

Detroit—All production scrap from automotive plants continues to move on directives to specified mills, and no lists are issued for bids. The latest Chevrolet "list," for example, included nothing beyond eight cars of mill scale. Dealers' buying prices on open-hearth and blast furnace material have held steady for the past three weeks or more. Sentimental weakness in cast scrap prices is not reflected in lower quotations, but buying has dwindled, indicating possibly some resistance to current high prices. Some scrap is still "leaking" out on scrap-for-sheet-steel deals but there is little the trade can do about it and the tonnage involved is not large.

Buffalo — Advanced scrap prices are being substantiated by additional purchases. Consumers who have been reluctant to recognize recently-increased prices now are reported placing orders. Fresh business took place in No. 2 heavy melting scrap at $32 a ton. Some dealers, however, continue to favor a range of $30 to $32. Sales also were reported at $33 to $34 a ton for No. 1 heavy melting. Tonnage of No. 1 material is limited. A return of milder weather, however, has spurred collections of No. 2 heavy melting and bundle grades. Malleable scrap remains scarce with prices gyrating according to the urgency of the individual consumer's demand.



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Rails, Cars . . .

Track Material Prices, Page 173

New York—Award of 3000 freight cars by the Louisville & Nashville features new car buying, and assures a fairly good total for the month just ended. Official statistics of the American Railway Car Institute should be available shortly. Several sizeable lists are being figured.

Demand for diesel locomotives is expanding, with the Pennsylvania Railroad having closed on 25, with 19 passenger locomotives to be of 6000 horsepower and 6 freight locomotives of 7500 horsepower. Nine of these engines will be built by the Baldwin Locomotive Works, Eddystone, Pa., six by the Electro-Motive Division of the General Motors Corp., La Grange, Ill., and five by the American Locomotive Co., New York. India has closed on 16 steam locomotives to Baldwin.

Warehouse . . .

Warehouse Prices, Page 174

New York—Slight improvement in replacements is noted by some warehouses. Gains in nails, however, are larger in galvanized than in bright wire nails. Receipts of steel, notably in lighter products and smaller sizes of heavier goods, will have to increase substantially before inventories will be in balance to meet heavy and unabated demand. Exceptions are alloys, stainless and heavier sizes of carbon bars. Perhaps indicating a future trend, demand for even smaller sizes of cold-finished carbon bars is slackening. Although price resistance by

domestic consumers is minor, some export cancellations have been directed to jobbers, including cold-finished bars.

Boston—Cold-rolled strip has been adjusted to 6.36c by most warehouses for 6000 pounds and over. Carbon plates bring 4.80c with some jobbers, although there are still differences in quotations among the various interests. In effect, the warehouse price structure has been rebuilt and is still subject to minor revisions. Demand for steel from warehouses is heavy and to meet it stocks are unbalanced, although slight improvement in replacements is noted. As demand is centered largely in smaller carbon products, warehouses are well supplied with alloys, larger and heavier bars, stainless and similar products on which a selling job appears ahead.

Pittsburgh—Uniform warehouse steel prices now prevail here, with further upward revision in shapes, plain and floor plates put into effect by Jones & Laughlin Steel Corp.'s warehouse. Distributors recently established new price base on hot-rolled alloy (4140) bars as-rolled of $6.60 for city and country delivery. New cold-rolled strip price base is $4.95 for city and $4.85 for country delivery, but this item is only handled by Follansbee Steel Corp.'s warehouse. In general new warehouse steel prices have been increased somewhat more than mill price bases plus revised extras to recover the normal price spread of $1 to $1.25 over mill price levels that were in effect prior to OPA. Distributors are revising mill specifications where possible to avoid new packaging extras, ordering to dead lengths, etc. For example, distributors are revising bundling specifications to larger quantities and absorbing extra handling cost; ordering cold-finished and hot-rolled bar stock in random lengths with 2-foot leeway, thus avoiding dead length mill extra of 15 cents.

Philadelphia—Jobbers here have concluded an excellent month, and look forward to continued good business for some weeks to come, especially now that the labor outlook has taken a decided turn for the better. Mill receipts last month were better than in the month before, and these receipts are expected to hold up, at least on a daily basis, through February and March.

Chicago—Warehouses continue to be handicapped by extremely low inventories. Meanwhile, demand continues in heavy volume, the recent increase in prices appearing to have had no effect in reducing or deferring business. Flat rolled products, principally sheets, strip and carbon bars, are the products in shortest supply. While mill shipments of these items to warehouse accounts is sizeable, the aggregate falls short of demand by substantial margins. Small structurals also are tight. Alloys are in sufficient supply to accommodate consumers' needs.

Cincinnati — Demand for warehouse steel apparently is expanding, although this surmise may be due to reduced shipments from mills. Structurals are particularly scarce, with requirements active. Almost all items are in active demand, against depleted stocks, with exception of heavy cold-finished.

Seattle — Jobbing houses report a heavy turnover of all items. Release of water shipments has eased the situation on some items but sheets continue ex-

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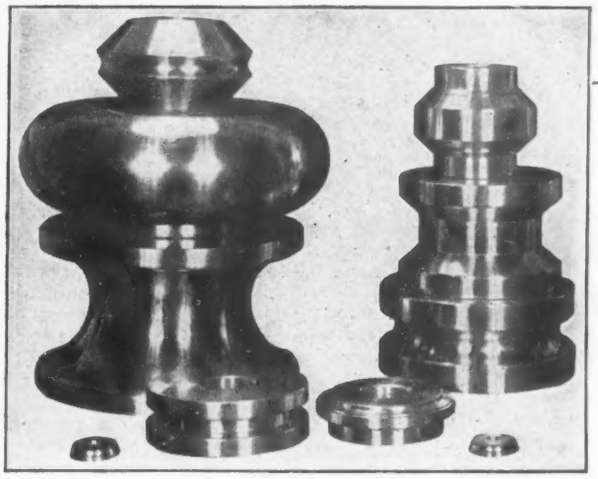

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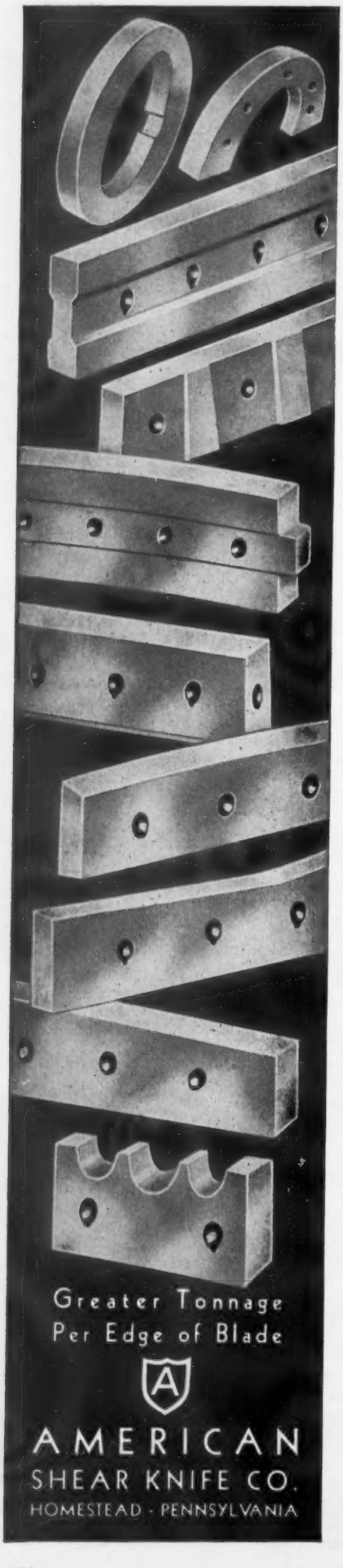


tremely critical. The new price levels have not retarded buying. Some black market operations, especially in sheets, are evident in this area. Demand is strong for plates, bars, shapes and alloys for which items the supply is easier, although none is equal to market requirements. New price lists absorbing recent mill increases have been issued to the trade.

Canada . . .

Toronto, Ont.—For the month of October, Canadian steel mills produced 154,183 tons of steel and shipped primary shapes totalling 172,580 net tons, which compares with 71,341 tons made and 72,070 tons shipped in September. The lower tonnages in September were due entirely to curtailed production in steel mills due to strikes. October totals include 146,979 tons of carbon steel made and 164,099 tons of iron and steel shapes shipped; 7,214 tons of alloy steel shapes made and 8,481 tons shipped.

For the first ten months of 1946, output of primary iron and steel shapes in Canada totalled 1,885,595 net tons and 1,896,638 tons shipped.

During October total shipments included 10,734 tons of semifinished shapes; 9,255 tons of structurals, 22,110 tons of plates; 1681 tons of galvanized sheets; 448 tons of tool steel, 6336 tons of castings and 42,914 tons of other shapes.

Of the October shipments, 15,245 went direct to railways and railway car shops, 7255 tons to pressing, forming and stamping plants, 19,294 tons to merchant trade products, 23,352 tons to building construction, 16,310 tons to the containers industry, 6118 tons to agricultural equipment, 8011 tons to the automotive industry, 12,496 tons to machinery plants, 3664 tons to shipbuilding, 5984 tons to mining, lumbering, etc., and 2379 tons to miscellaneous industries. Wholesalers and warehousing accounted for 19,769 tons; producers' interchange, 25,484 tons and exports, 7219 tons.

Nonferrous Metals . . .

Nonferrous Prices, Page 177

New York — Office of War Mobilization and Reconversion has revised its regulations for making premium payments to producers of copper, lead and zinc. Under the new ruling, producers may not include as part of their "reasonable costs" any increases in royalties they may have paid above the level of royalty rates in effect Nov. 10.

The government's premium payments on these metals is tied to the cost of production. Royalty payments by a producer to the actual owners of the land which is mined are included as a part of the cost of production. However, OWMR now rules that it will accept as part of the cost only that part of the royalty which was in effect on Nov. 10. In other words, a producer who is paying increased royalties cannot be reimbursed by higher premium payments. The agency said it was acting to prevent undue diversion of premium money into royalty payments following the revocation on Nov. 10 last of a government regulation setting maximum royalty rates.

Copper — American Smelting & Refining Co. advanced the price of electrolytic copper last week one cent a pound to the basis of 20.50c, Connecticut Valley. Other leading sellers had not followed by late in the week.

As of the close of business, Dec. 31, fabricators' refined stocks totaled 408,943 tons compared with 375,618 tons a year earlier. Working stocks of 286,418 tons left visible supplies of 122,525 tons to which is added 59,421 tons of copper which had been purchased but undelivered, making total stocks and purchases 181,946 tons. Unfilled orders at the year-end totaled 526,648 tons. Stocks available for sale were estimated minus 344,702 tons.

Silver — Demand for foreign silver in the domestic market remained small last week. The silvermakers and industrial users continued to send in scrap metal for remelting and reuse. At the same time these commercial users of silver are believed to be reducing inventories. Prices held unchanged at 71.00c an ounce for foreign mined metal and 70.75c for domestic metal.

Repeal of Excise Tax on Copper Imports Requested

(*Continued from Page* 79)

bate. One group argues that the United States needs far more copper than can be provided domestically, and that the importation of this needed copper with the 4-cent tax added would be unnecessarily costly to consumers and would discourage importations. The opposing school of thought maintains that the current heavy demand stems from accumulated needs, with the present strong demand therefore only temporary, and that for the economic well-being of the United States the domestic copper industry should be protected.

Recently, one opponent of the 4-cent tax said there is absolutely no need for a tariff on copper for perhaps the next three to five years, as domestic demands in all likelihood will continue to run far in excess of domestic supplies. And, he said, as the same situation exists in countries outside the United States there is consequently no threat to the American economy and therefore no necessity for so-called tariff protection at this time.

The two primary considerations involved in the imposition of a tariff are protection for domestic industry and revenue, the tax opponent said. The former, he declared, obviously is not needed now. As to revenue, he pointed out that the government has been waiving the tax on all foreign copper it has purchased during the past several years and allocated to consumers at the prevailing domestic price, and that the government will be no worse off if the excise tax is abolished.

Recently, Charles F. Willis, secretary, Arizona Small Mine Operators Association, declared that manufacurers and foreign producers refuse to admit that the present shortage of copper is temporary and is due primarily to pent-up require-

ments combined with the fact that the war left the mines in the U. S. in poor condition to meet such an extraordinary demand. "Since during the war all efforts were directed toward production, exploration and development were neglected and plants were not well maintained. Also labor shortage and postwar strikes have cut down production at a time when greater output was essential," Mr. Willis stated.

In its appeal, the Scovill Mfg. Co said that domestic copper production is estimated not to exceed 80,000 tons monthly, while the demand for copper shows no tendency to decrease. Delivery of copper in December was 148,218 tons, comprised of 87,642 tons of domestic and 60,576 tons of foreign copper (the latter being duty paid copper furnished by Metals Reserve), the company said. "The obvious monthly deficit can be made up only by purchase of foreign copper," the company declared.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

5835 tons, Connecticut State bridge, Old Lyme and Old Saybrook, to American Bridge Co., Pittsburgh. Award of about 2500 tons of piling through Merritt-Chapman & Scott, New York, expected to be announced shortly.

3000 tons, fourth section to power plant, Venice, Ill., for Union Electric Co. divided between Stupp Bros. Bridge & Iron Co., St. Louis, and Missouri Valley Bridge & Iron Works, Leavenworth, Kans.; Stone & Webster Engineering Corp., Boston, engineers.

1000 tons, boiler house, Denver, for Public Service Co. of Colorado, to Midwest Steel & Iron Works Co., Denver.

994 tons, coffer dam, Spec. 1571, Shasta dam, Central Valley, Calif., for Bureau of Reclamation, to American Bridge Co., Pittsburgh; bids to Denver, Jan. 6.

590 tons, crane runway, China, to American Bridge Co., Pittsburgh.

525 tons, fertilizer plant, Saginaw, Mich., for Farm Bureau Service, to Jarvis Engineering Works, Lansing, Mich.

500 tons, electrical engineering building, Urbana, Ill., for University of Illinois, to Duffin Iron Co., Chicago; John Felmley Co., Bloomington, Ill., contractor; bids Jan. 21.

500 tons, power house, Harryatt, Ga., for Georgia Power Co., to Virginia Bridge Co., Roanoke, Va.

400 tons, storage building, Baton Rouge, La., to Virginia Bridge Co., Roanoke, Va.

350 tons, extension to Solvay Process plant, Baton Rouge, La., to Virginia Bridge Co., Roanoke, Va.

226 tons, penstocks for Kortes power plant, Casper, Wyo., for Bureau of Reclamation, to Darby Products of Steel Plate Corp., Kansas City, Kans.; bids Jan. 13.

206 tons, roof and framing for machine shop, Spec. 1567, Grand Coulee dam, Odair, Wash., for Bureau of Reclamation, to Worden-Allen Co., Milwaukee; bids to Denver, Jan. 6.

145 tons, power plant, Bridgeport Brass Co., to Haarmann Steel Co., Holyoke, Mass.; Stone & Webster Engineering Corp., Boston, contractor-engineer.

140 tons, bridge, Swink, Colo., for state, to Midwest Steel & Iron Works Co., Denver; Brown Construction Co., contractor.

120 tons, building, Cedar Rapids, Iowa, for Cherry-Burrell Corp., to Iowa Steel & Iron Works, Cedar Rapids, Iowa.

112 tons, stop logs, Spec. 1560, Grand Coulee dam, Odair, Wash., for Bureau of Reclamation, to Consclidated Steel Corp., Los Angeles; bids to Denver, Jan. 2.

STRUCTURAL STEEL PENDING

8000 tons, Augusta, Ga., for U. S. Engineer.

4500 tons, barges, Middletown, O., for American Rolling Mill Co.

4500 tons, generating station, for Philadelphia Electric Co., near Norristown, Pa.; bids due Feb. 7.

3655 tons, steel piling, including 2847 tons sheet piling and 808 tons bearing piling, Cont. No. 1, Northerly Island Airport, Chicago, for City of Chicago; bids Feb. 13.

1900 tons, new bessemer converter plant, Ecorse, Mich., for Great Lakes Steel Corp.

700 tons, board plant, Sigurd, Utah, for United States Gypsum Co.

575 tons, two bridges, route S-3, section 4A, carrying highway over tracks, Delaware, Lackawanna & Western railroad, Clifton, N. J.; bids Feb. 17, Spencer Mill Jr., state highway commissioner, Trenton, N. J.

575 tons, state highway bridge work, S-3, section 4-A, Passaic county, New Jersey, bids Feb. 17; also 230 tons of reinforcing steel, as noted in previous issue. Bids on a 2000-ton bascule span in that county is up for bids Feb. 13, a development that will also require 216 tons of reinforcing steel and 200 tons of machinery.

550 tons, mill building, Memphis, Tenn.; H. K. Ferguson Co., Cleveland, contractor.

475 tons, continuous girder highway bridge, Stratford, Iowa, for state; recent bids rejected.

420 tons, diesel shop, Barstow, Calif., for Atchison, Topeka & Santa Fe Railroad; bids Jan. 27.

405 tons, railroad grade separation, Fayette county, Ill., for State Highways Division; bids Feb. 7.

350 tons, highway bridge, Port Gibson, Miss., for State Highway Department.

205 tons, state bridge, Cambria county, Pennsylvania, bids Mar. 3.

185 tons, bridge, Sec. 3F, Marshall county, Ill., for State Highways Division; bids of Jan. 10 rejected; new bids Feb. 7.

120 tons, bridge, Sec. 43F, Pike county, Ill., for State Highways Division; bids of Jan. 10 rejected; new bids Feb. 7.

112 tons, two-span I-beam bridge, 168-foot span, Richmond, Vt.; bids to town clerk, that town, Feb. 10.

105 tons, state bridge, LR-20046, Crawford county, Pennsylvania, bids Mar. 3.

105 tons, state bridge, Elmhurst township, Lackawanna county, Pennsylvania, bids Feb. 21.

100 tons, state bridge, York county, Pennsylvania, bids Mar. 3.

Unstated, steel frame for timber treating plant, Everett, Wash., also several retorts; bids to Engineer M. O. Sylliaasen, Seattle, Feb. 14.

Unstated, steel frame telephone exchange addition, Eugene, Oreg., for Pacific Telephone & Telegraph Co.; general contract to Waale-Camplan Co., Portland, Oreg., low $142,000.

Unstated, prefabricated machine shop, two radial gates and two gate hoists for projects in Idaho; bids to Bureau of Reclamation, Denver, Feb. 19 and 24, respectively.

REINFORCING BARS . . .

REINFORCING BARS PLACED

300 tons, milling plant, Huron, O., for Eastern Mill Co-operative Association, to Bethlehem Steel Co., Bethlehem, Pa.; James Stewart Corp., Chicago, Contractor.

230 tons, two bridges, route S-3, route 4A, carrying highway over tracks, Delaware, Lackawanna & Western railroad, Clifton, N. J.;

Tops on Speed in Handling
Coil Stock
COIL stock, fed by LITTELL Automatic Centering Reels, insures efficient, fast, accurate, economical production. It permits continuous feeding, prevents waste of material and provides automatic roll feeding direct from coils.
LITTELL Reels automatically center coils. Ball bearing, they are easy running and insure free-moving coils for accurate feeding. Adjustable stock support holds up loose loops of coils and permits very light brake adjustment.
Plain and motor-driven types. Capacities, 300 to 6,000 lbs. Coil Cradles can be supplied for coils up to 20,000 lbs.
LITTELL also makes Roll Feeds, Dial Feeds, Feeding and Straightening Machines, Scrap Winders, Air Blast Valves, Pres-Vac Safety Feeders and Mechanical Pickers.
REQUEST BULLETINS
SPEED WITH SAFETY
F.J. LITTELL MACHINE CO.
4165 RAVENSWOOD AVE. CHICAGO 13 ILL.

bids Feb. 17, Spencer Miller Jr., state highway commissioner, Trenton.

200 tons, science hall and boiler plant, state college, Ellensburg, Wash., to Northwest Steel Rolling Mills, Seattle; general contract to MacLean Construction Co., Seattle, low, $1,214,370.

151 tons, including 100 tons wire mesh and 51 tons bars, Cont. 2791, Kosciusko county, Ind., for State Highway Commission, mesh to American Steel & Wire Co., Chicago, and bars to Carnegie-Illinois Steel Corp., Chicago; Gast Construction Co., Warsaw, Ind., contractor; bids Jan. 7.

Unstated, miscellaneous sizes, for Department of Public Works, Chicago, as ordered for Bureau of Engineering of the department during period ending Dec. 31, 1947; bids Feb. 7.

REINFORCING BARS PENDING

600 tons, spillway Dorena dam, Oregon; bids to U. S. engineer, Portland, Oreg., March 20.

230 tons, state bridge, Passaic county, New Jersey, bids Feb. 17; also 575 tons of structurals, and 216 tons, state bridge, Passaic county, New Jersey, bids Feb. 13; also 2000 tons of shapes, as noted in a previous issue, and 200 tons of machinery.

120 tons, electrical engineering building, Urbana, Ill., for University of Illinois; general contract to John Felmley Co., Bloomington, Ill.; bids Jan. 21.

Unstated, $750,000 warehouse for Montgomery Ward & Co., Portland, Oreg.; bids soon.

Unstated, mechanical engineering building, Urbana, Ill., for University of Illinois; bids Feb. 3.

Unstated tonnage, patients building, Byberry State Hospital, Philadelphia; bids Feb. 19.

PIPE . . .

CAST IRON PIPE PLACED

200 tons, 6 and 8-inch, Springfield, Mass., to United States Pipe & Foundry Co., Burlington, N. J.

155 tons, Bellingham, Wash., project, to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

STEEL PIPE PLACED

140 tons, large diameter fabricated pipe, for installation in connection with gas holder development for Philadelphia Electric Co., at Chester, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

CAST IRON PIPE PENDING

750 tons, various sizes for Spokane, Wash., bids in Jan. 23.

RAILS, CARS . . .

RAILS PLACED

Florida East Coast, 16,500 tons, with 12,500 tons going to the Tennessee Coal, Iron & Railroad Co., Birmingham, and 4000 tons to Bethlehem Steel Co., Bethlehem, Pa.

LOCOMOTIVES PLACED

India, 16 steam locomotives, to Baldwin Locomotive Works, Eddystone, Pa.

Pennsylvania Railroad, 25 diesel locomotives, comprising 19 passenger locomotives of 6000 horsepower and 6 freight locomotives of 7500 horsepower; 9 to Baldwin Locomotive Works, Eddystone, Pa., 6 to Electro-Motive Division of General Motors Corp., La Grange, Ill., 5 to American Locomotive Co., New York.

RAILROAD CARS PLACED

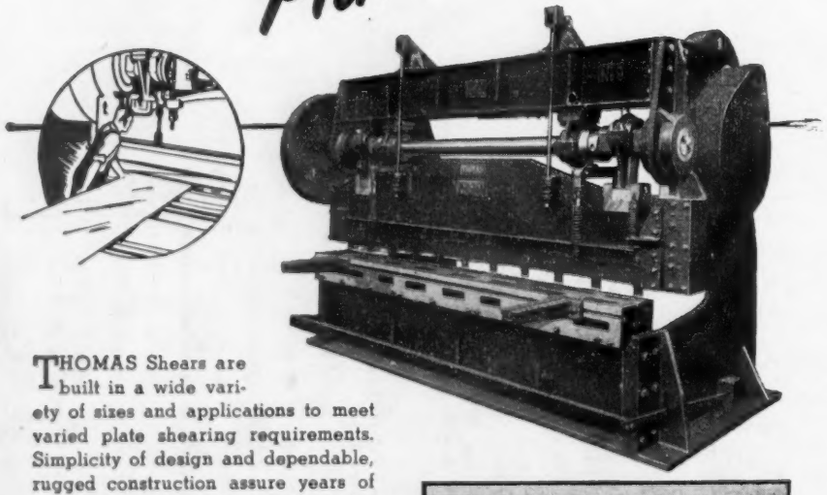
Chesapeake & Ohio, 1000 hopper cars, to General American Transportation Corp., Chicago.

Louisville & Nashville's order for 3000 cars was distributed as follows: 1600 fifty-ton hopper cars to Pullman-Standard Car Mfg. Co., Chicago; 1200 fifty-ton hopper cars and 200 seventy-ton ballast cars to American Car & Foundry Co., New York.

New York City Board of Transportation, 10 stainless steel subway cars, to the Budd Co., Philadelphia.

THOMAS

MILL TYPE Plate Shears



THOMAS Shears are built in a wide variety of sizes and applications to meet varied plate shearing requirements. Simplicity of design and dependable, rugged construction assure years of maintenance-free operation. *Write for Bulletin 126.*

THOMAS
MACHINE MANUFACTURING COMPANY
PITTSBURGH, 23, PA.

CONSTRUCTION AND ENTERPRISE

ALABAMA

BIRMINGHAM—Allen Unit Construction Inc. has been formed by Charles T. Allen and Charles T. Allen Jr. to manufacture precast steel and concrete houses in sections.

TUSCALOOSA, ALA.—Gulf States Paper Corp. has awarded contract to H. K. Ferguson Co., Cleveland, for engineering, construction and installation of equipment in a new plant addition which will boost paper production by more than 50 per cent.

CALIFORNIA

EAST LOS ANGELES, CALIF. — Wilcox Co., 6800 McKinley Ave., Los Angeles, has awarded a $215,000 contract to H. Mayson, 9215 S. Hooper Ave., Los Angeles, for a factory at 4463 Bandini Blvd.

LOS ANGELES—Mission Appliance Co., 7101 McKinley Ave., has contracted for a 1-story, 150 x 800 ft factory with Al-Co Co., 5423 Flemish Village Lane, for an approximate $425,000.

LOS ANGELES — United States Rubber Co., 5675 Anaheim-Telegraph Rd., plans construction of a 1-story warehouse, 360 x 521 ft to cost $896,000. L. A. Parker, 408 S. Spring St., is engineer and architect.

YUMA CITY, CALIF. — Pacific Gas & Electric Co., 245 Market St., San Francisco, has plans under way for a substation to cost $245,328.

CONNECTICUT

EAST HARTFORD, CONN. — Pratt & Whitney Division, United Aircraft Corp., 400 Main St., has awarded a contract to Turner Construction Co., 38 Newbury St., Boston, for conversion of a factory to a refrigeration plant at cost of $175,000. Engineer is Albert Kahn Associated Architects-Engineers Inc., New Center Bldg., Detroit.

MERIDEN, CONN.—International Silver Co., State St., has awarded a contract to H. Wales Lines Co., 134 State St., to build a three-story factory which will cost $191,700.

FLORIDA

CHATTAHOOCHEE, FLA.—U. S. Engineer Office, Jacksonville, Fla., is planning construction of 6400-ft dam and powerhouse with 27,000-kw capacity, to cost approximately $24 million.

JACKSONVILLE, FLA.—General Chemical Co., New York, c/o district construction manager, Jacksonville, Fla., plans construction of 2-story sulphate alumina plant, to cost $260,000. CPA approval has been received.

GEORGIA

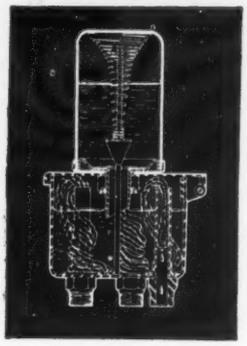
ATLANTA—Peaslee-Gaulbert Corp., Louisville, contemplates construction of plant to contain about 150,000 sq ft, which will be used for manufacture of restaurant and hotel equipment, refrigerators, etc.

ATLANTA—Georgia Power Co., 75 Marietta St., has awarded contract for substructure of electric generating plant to be built about 7 miles northwest of Atlanta on Chattahoochee river at cost of $670,000 to Gilbert Beers, Atlanta.

ATLANTA—Fairbanks, Morse & Co., 515 Whitehall St. SW, has awarded contract to Ben J. Massell Co., Pryor St., for construction of warehouse and repair shop for electrical appliances and hardware goods, to cost approximately $150,000. H. A. Rawlins, 32 Pryor St. NE, architect.

ATLANTA—Georgia Power Co., W. E. Mitchell, president, plans expenditure this year of more than $17 million for extension and improvement of services over the state. Included in the program will be construction of 900 miles of electric distribution lines, 356 miles of new rural lines and 135 miles of high tension transmission lines; also included

Lubricate...



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GASOLINE UTILITY MOTOR

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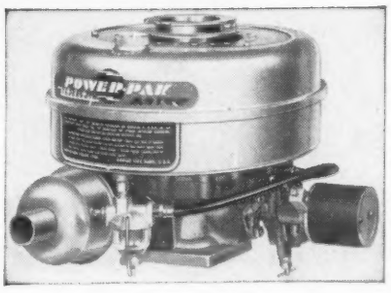

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POWER-PAK is compactly designed, light weight (only 19 lbs.), every piece and part of finest materials to insure long, smooth, trouble-free operation. Overall length 14⅝", width of cowling 9½", height 8¹³⁄₁₆". Easily installed . . . economical on fuel . . . easy access to all vital parts. Replacement parts always in stock. Let POWER-PAK solve your power problem.

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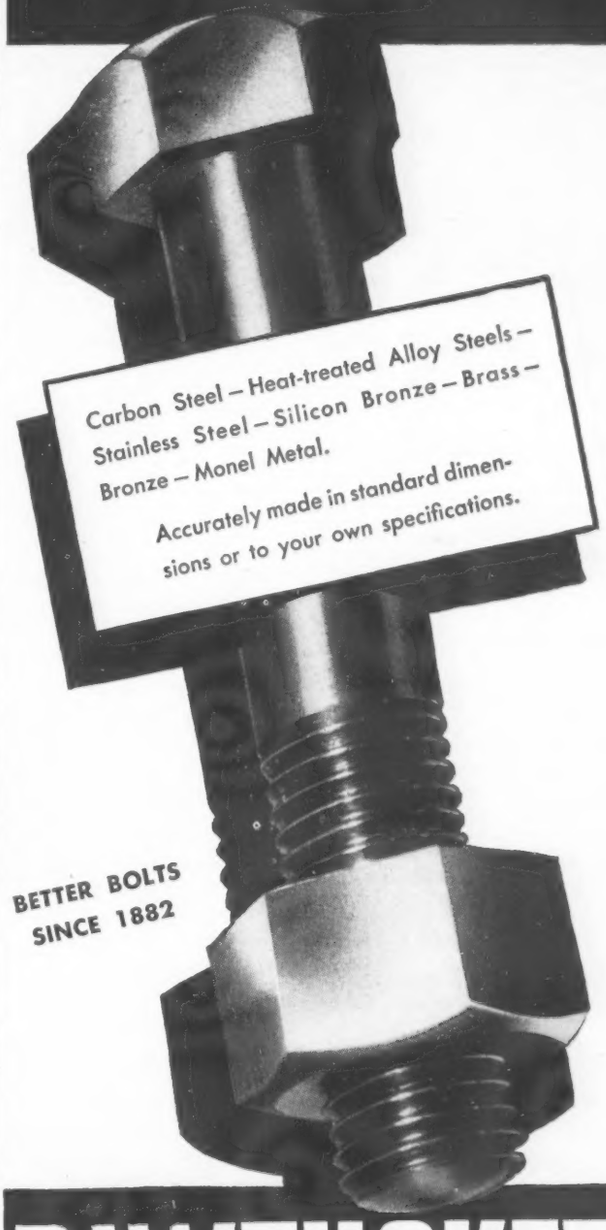
BOLTS · NUTS STUDS



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WATER
MEANS A LOT
TO CITIES LIKE SIOUX FALLS, S. D.

Sioux Falls, S. D., is a typical American City. Like many other smaller towns, it is growing into a much more important distribution and manufacturing point. Water for further growth was needed in large—but economical quantities. The choice was a Layne Well Water System that is now producing a million gallons daily.

Sioux Falls is not burdened by high operation cost, and furthermore there will be very little—or perhaps no repair expense for years to come.

Layne Well Water Systems, used and famous the world over, are engineered for heavier duty than ever called upon to perform. Such extra ruggedness and remarkably fine quality makes them an unmatched investment for any city or industry. These Well Water Systems are built in a wide range of capacities suitable for present needs and future growth. Space requirements are small and installations can be completed in a matter of weeks.

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Layne Vertical Turbine pumps are available in sizes to produce from 40 to 16,000 gallons of water per minute. High efficiency saves hundreds of dollars on power cost per year.

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LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

will be addition of 45 new substations with total capacity of 51,800 kw and enlargement of 67 existing substations.

WAYCROSS, GA.—Air Reduction Sales Co., 50 E. 42nd St., New York, plans construction of oxygen gas manufacturing plant, to cost $165,000. Plans by own engineering department.

ILLINOIS

BUSHNELL, ILL.—Nickelberry Food Products Co., 801 W. 40th Place, Chicago, plans a $500,000 addition to its plant here.

CHICAGO — Sam Cassel Co., 833 W. Randolph St., has awarded to Poirot Construction Co., 2001 W. Pershing Rd., a contract for a 1-story factory and office, 222 x 232 ft costing $135,000. A. Epstein, 2011 W. Pershing Rd., is engineer.

CHICAGO — White Cap Co., 1819 N. Major St., has awarded a $150,000 contract for a 2-story, 220 x 152 ft factory addition to Campbell-Lowrie-Lautermilch, 400 W. Madison St. The plumbing went to S. J. Reynolds Co., 2229 W. Ogden Ave. Architects are Olsen & Urbain, 75 E. Wacker Dr.

CHICAGO — Garden City Plating & Mfg. Co., 1430 S. Talman Ave., plans a 1-story factory to cost about $300,000.

MELROSE PARK, ILL. — Sterling Tool Products, 363 E. Ohio St., Chicago, plans to build a 1-story factory, to cost $235,000.

MONSANTO, ILL. — Monsanto Chemical Co., 1700 S. Second St., St. Louis, proposes to construct a $3 million plant here.

QUINCY, ILL.—Continental Oil Co., 100 S. Front St., will soon let contracts for a $500,000 addition to its terminal on Harrison street.

RIVERDALE, ILL. — Acme Steel Co. plans a 1-story building, 150 x 400 ft. Estimated cost is $412,275.

ROCKFORD, ILL.—Rockford Fibre Container Corp., 200 Sayre St., contemplates building a $1 million factory addition.

INDIANA

BICKNELL, IND. — Public Service Co. of Indiana, R. A. Gallagher, president, Indianapolis, plans a $5 million project with installation of 37,500 kw generating unit near Bicknell, and a 132,000 volt transmission line.

KOKOMO, IND. — Haynes Stellite Co., Harrison and Lindsay Sts., plans an alloy rolling mill on a 40-acre site west of the city to cost $620,000.

MISHAWAKA, IND. — Indiana & Michigan Electric Co., 220 W. Colfax St., South Bend, Ind., plans a 1-story power plant, a 1-story boiler plant and a 190,000 kw generator at estimated cost of $15 million. American Gas & Electric Service Corp., 30 W. Church St., New York, is consulting engineer.

LOUISIANA

NEW ORLEANS—Paragon Tool & Mfg. Co., Marcel J. Bayhi, president, 1544 Florida Ave., is having plans prepared by Allied Engineering & Construction Co., 1029 Philip St., for new plant on Industrial Canal.

MARYLAND

BALTIMORE—Zinc Chemical Co., New York, Walter C. Bennett, president, plans construction of plant for various grades of zinc sulphate, to be owned jointly by Glidden Co., which will handle production, and International Minerals & Metal Corp. and Phelps Dodge Refining Corp., which will handle sales.

MASSACHUSETTS

SPRINGFIELD, MASS. — Monsanto Chemical Co. has placed a contract with Adams & Ruxton Construction Co., 1387 Main St., for a 3-story 60 x 120 ft plant at 812 Monsanto Ave. It will cost $175,000.

MICHIGAN

DETROIT—Michigan Drill Head Co., 971 E. Eight-Mile Rd., has been formed to manufacture tools and dies. Gordon J. Burkett, 17371 Pennington Dr., heads the venture which has a capital of $200,000.

DETROIT—Bernard S. Epps & Co., 8215 Moran St., has been formed with 20,000 shares of stock at no par value and $50,000 capital to buy and sell steel and steel products.

DETROIT—Acme Spring Products Co., 2813 W. Fort St., has been formed with capital of $50,000 to deal in metal products, by Arthur Faber.

GRAND RAPIDS, MICH.—Frank Edge Saw Mfg. Co., 549 Ottawa Ave. N. W., has been formed to manufacture saw products by Walter A. Robson, 208 Ball Park Blvd. N.W. Capitalization is $50,000.

NEW JERSEY

TRENTON, N. J. — Delaval Steam Turbine Co., 553 Nottingham Way, has named John W. Ferguson Co., 152 Market St., Paterson, N. J., builder of its $55,000 plant addition.

NEW YORK

BROOKLYN, N. Y. — American Safety Razor Corp., 315 Jay St., has had plans completed by William Higginson & Son, 101 Park Ave., New York, for altering an 8-story factory and warehouse, 71 Myrtle Ave. Cost will be $400,000.

OHIO

CLEVELAND — Basic Refractories Inc., Hanna Bldg., will construct a plant at Maple Grove, O., for about $700,000.

CLEVELAND — Star Welding & Engineering Co., 5140 Superior Ave., will build a $60,000 plant on E. 134th St. north of St. Clair Ave.

CLEVELAND—Erie Casting Co. has been incorporated by Dan Balzano, 1449 E. 115th St. The firm is planning to build a plant on Green Rd. and is now purchasing necessary machinery and equipment to start operations.

CLEVELAND—Harry Ferguson Inc., who recently bought Cleveland Pneumatic Aerol Co. plant at 20001 Euclid Ave., will begin extensive alterations immediately.

COLUMBUS, O.—Ohlen-Bishop Mfg. Co., 901 Ingleside Dr., will build a 1-story factory and a 2-story office building on a 27-acre tract near here. C. M. Barr Co., 299 S. Front St., is the contractor and Sims, Cornelius & Schooler, 2901 N. High St., are the architects for the job which is estimated at $1 million.

MIDDLETOWN, O.—American Rolling Mill Co. will build a $118,700 addition to its mill.

PENNSYLVANIA

JOHNSTOWN, PA. — Bethlehem Steel Co., Bethlehem, Pa., proposes to build a 1-story mill building, an extension to a shipping and finishing building, a pump and compressor building, a boiler house and a 1-story erection plant to cost $1,988,000.

PHILADELPHIA—John E. Sjostrom Co. Inc., 1715 N. 10th St., will soon let a contract for a 3-story, 100 x 101 ft plant and 1-story, 33 x 53 ft garage to cost $500,000. Ballinger Co., 105 S. 12th St, is the architect.

CANADA

TORONTO, ONT. — Mine Safety Appliances Co., 110 Dupont St., will build for about $75,000 a 6-story, 60 x 60 ft plant addition. Milne & Nicholis Ltd., 57 Bloor St. W., are contractors, and Prack & Prack, Pigott Bldg., Hamilton, Ont., are architects.

MONTREAL, QUE.—Standard Electric Co., 209 Craig St., W. I. Blatt, president, has awarded a $450,000 contract to J. A. Berube, 3957 Rivard St., for erection of a 4-story, 100 x 190 ft factory. Architect is R. Fisher, 784 Wiseman Ave., Outremont.

MONTREAL, QUE. — Montreal Armature Works Ltd., 279 Shannon St., has contracted with Cathcart Construction Co., 5675 Western Ave. for a $60,000 warehouse, 90 x 201 ft. Architect is Shorey & Co., 2048 Union Ave.

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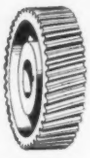
—and "Industrial" Gear's reputation for DEPENDABILITY is uppermost in the minds of the craftsmen who cut our gears. They are proud of their skill and derive real satisfaction in "Industrial's" recognition for the finest in Gears.



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Hand Operated **Weight 70 lbs.**
Capacity 3/16" hole through 1/4" metal

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Punches and dies are carried in stock in a large range of sizes. New sizes are constantly being added to the line as the demand for them develops.

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Flat	Regular Oval	Semi-Circular End Oval		Square	
3/8" x 1/4"	1/2" x 5/16"	1/2" x 5/16"	11/32" x 9/32"	3/8"	17/64"
5/16" x 1/4"	1/2" x 9/32"	1/2" x 9/32"	11/32" x 7/32"	11/32"	1/4"
5/16" x 3/16"	1/2" x 3/16"	1/2" x 7/32"	5/16" x 1/4"	21/64"	7/32"
1/4" x 3/16"	1/2" x 5/32"	1/2" x 3/16"	5/16" x 9/64"	5/16"	3/16"
	13/32" x 9/32"	1/2" x 5/32"	9/32" x 7/32"	9/32"	5/32"
					9/64"

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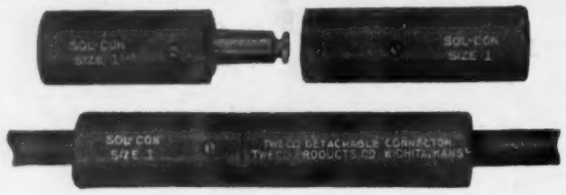

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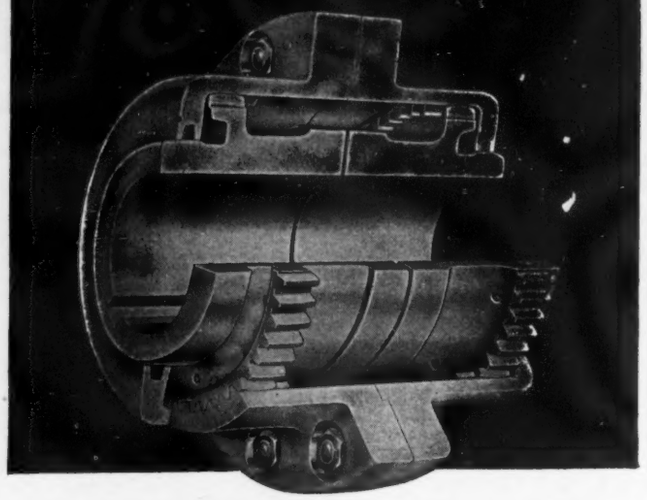

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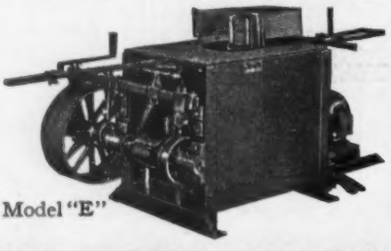

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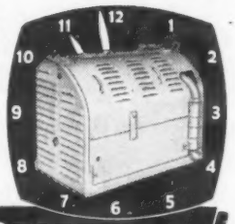

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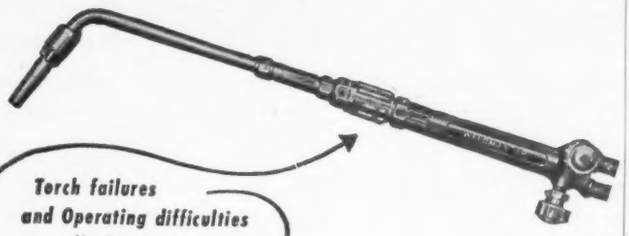

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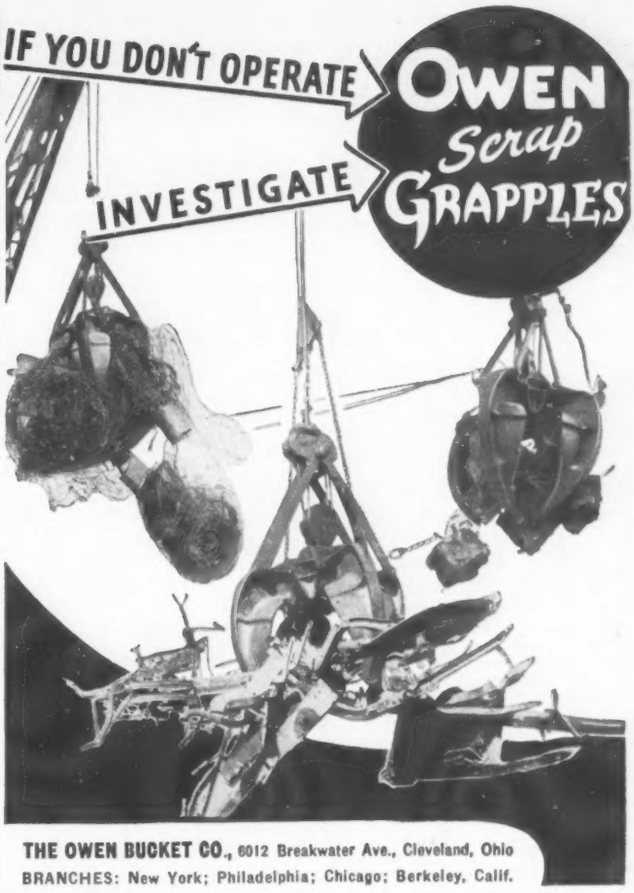

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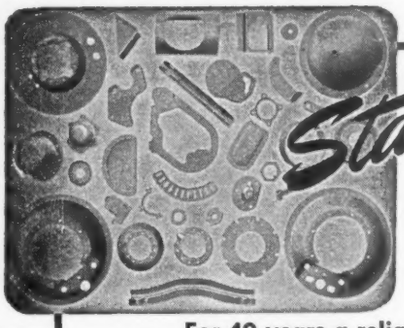

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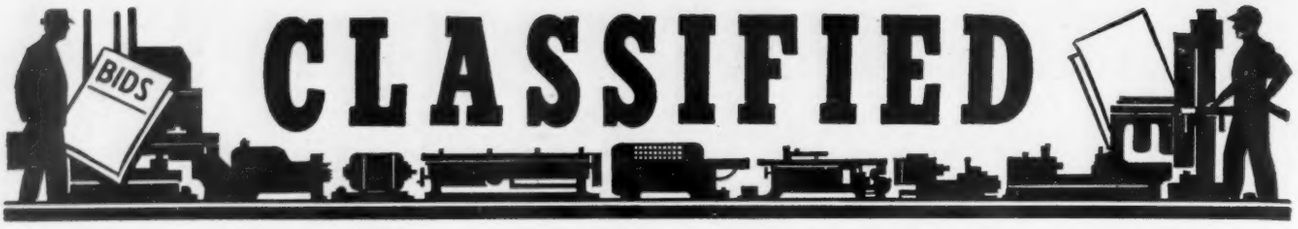

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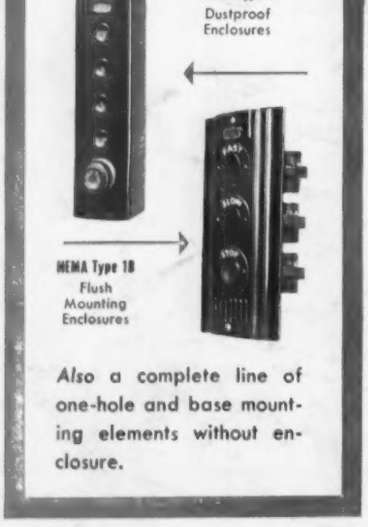

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